GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208-volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

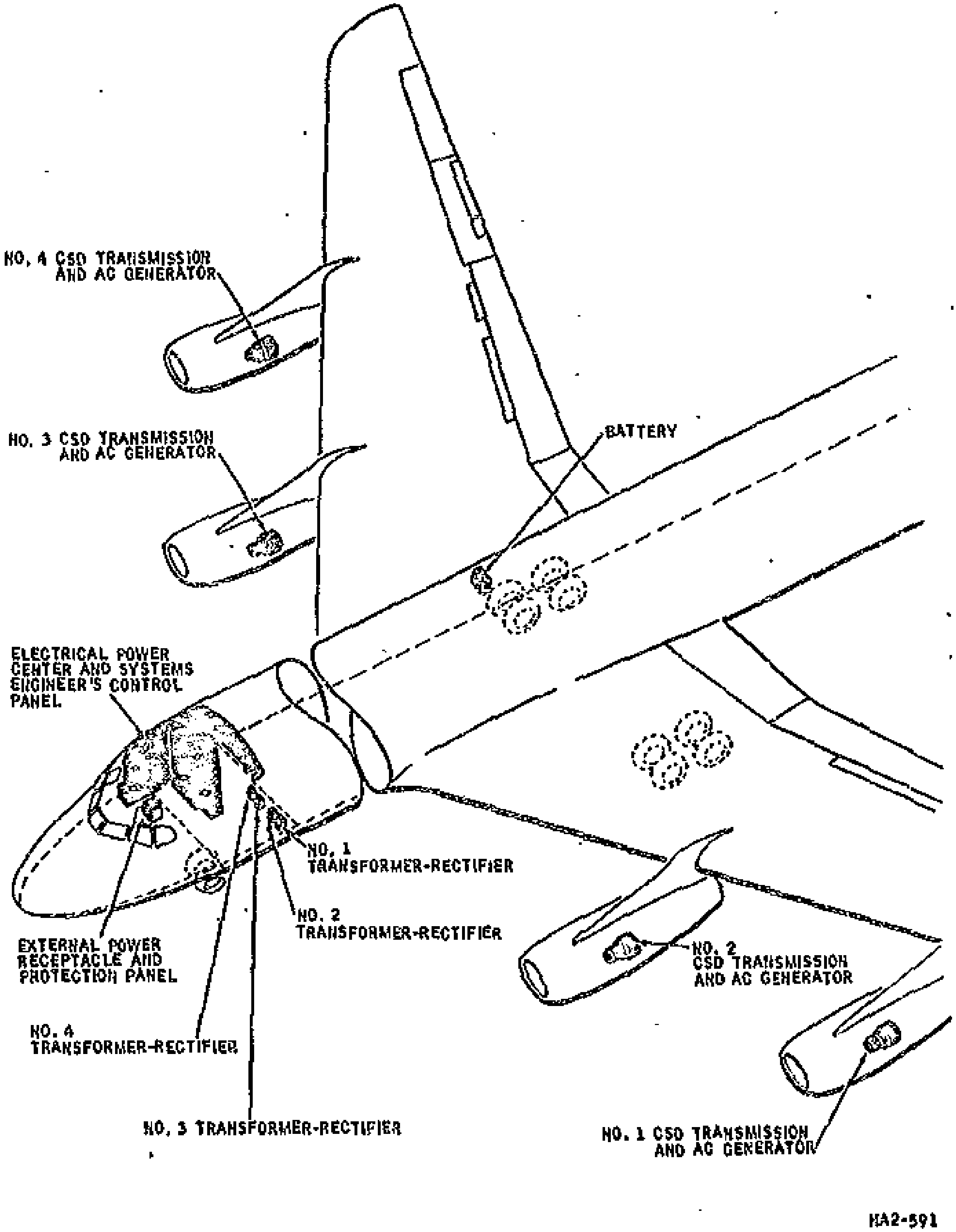
B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant speed drive (CSD) transmission. Frequency is normally maintained at 400 (±0.1) cps by a frequency and load control panel which transmits signals to the magnetic trim head of the CSD transmission speed governor, thus correcting CSD output speed to maintain 400 (±0.1) cps. If the CSD transmission is operating on the speed governor, without the fine frequency control of the frequency and load control panel, the frequency is maintained at 400 (±4) cps.

C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

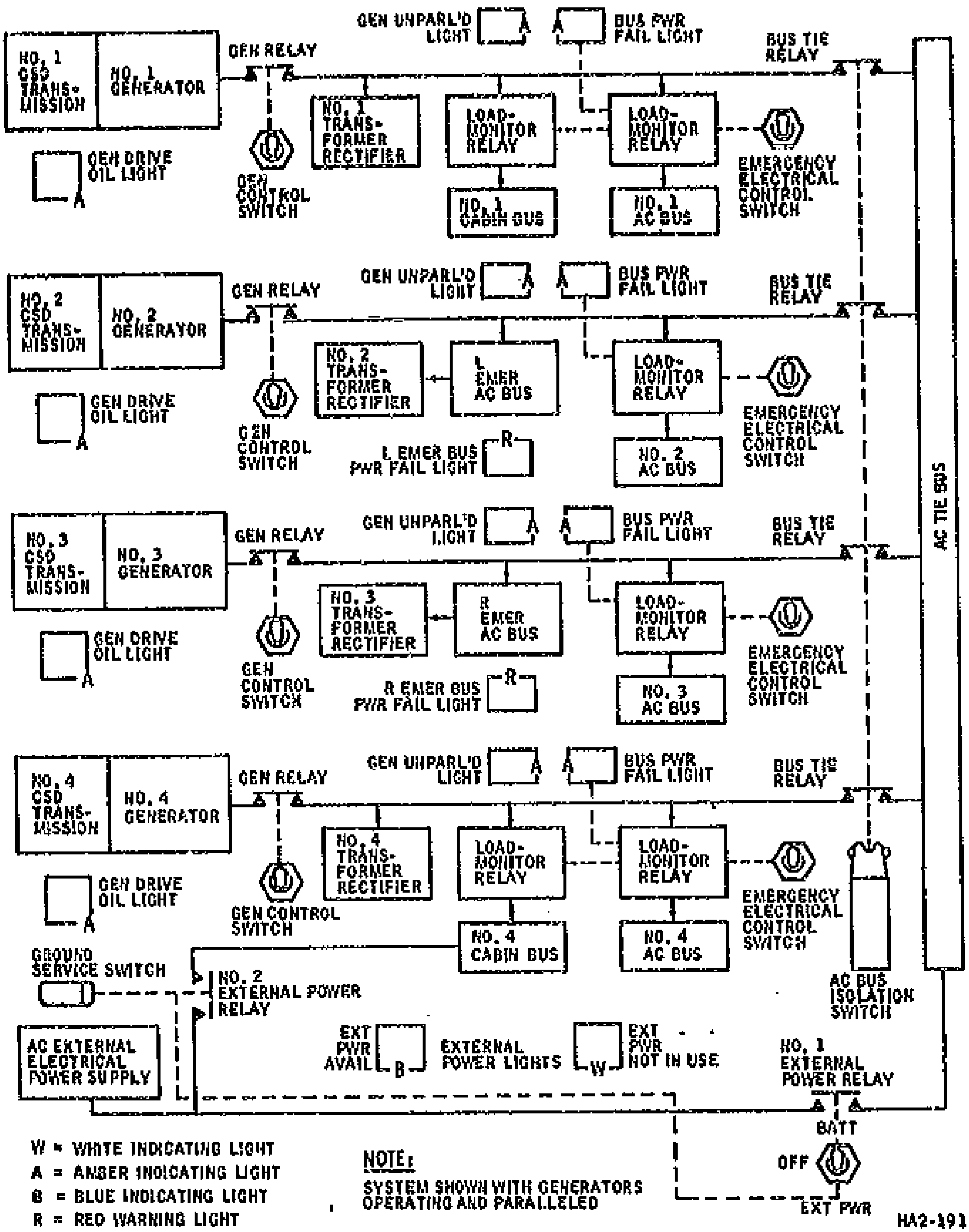
D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus, and the No. 3 generator bus is connected directly to the right ac emergency bus.

E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.



Electrical Power System Installations
Figure 1



Ac Power Distribution -- Block Diagram
Figure 2

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

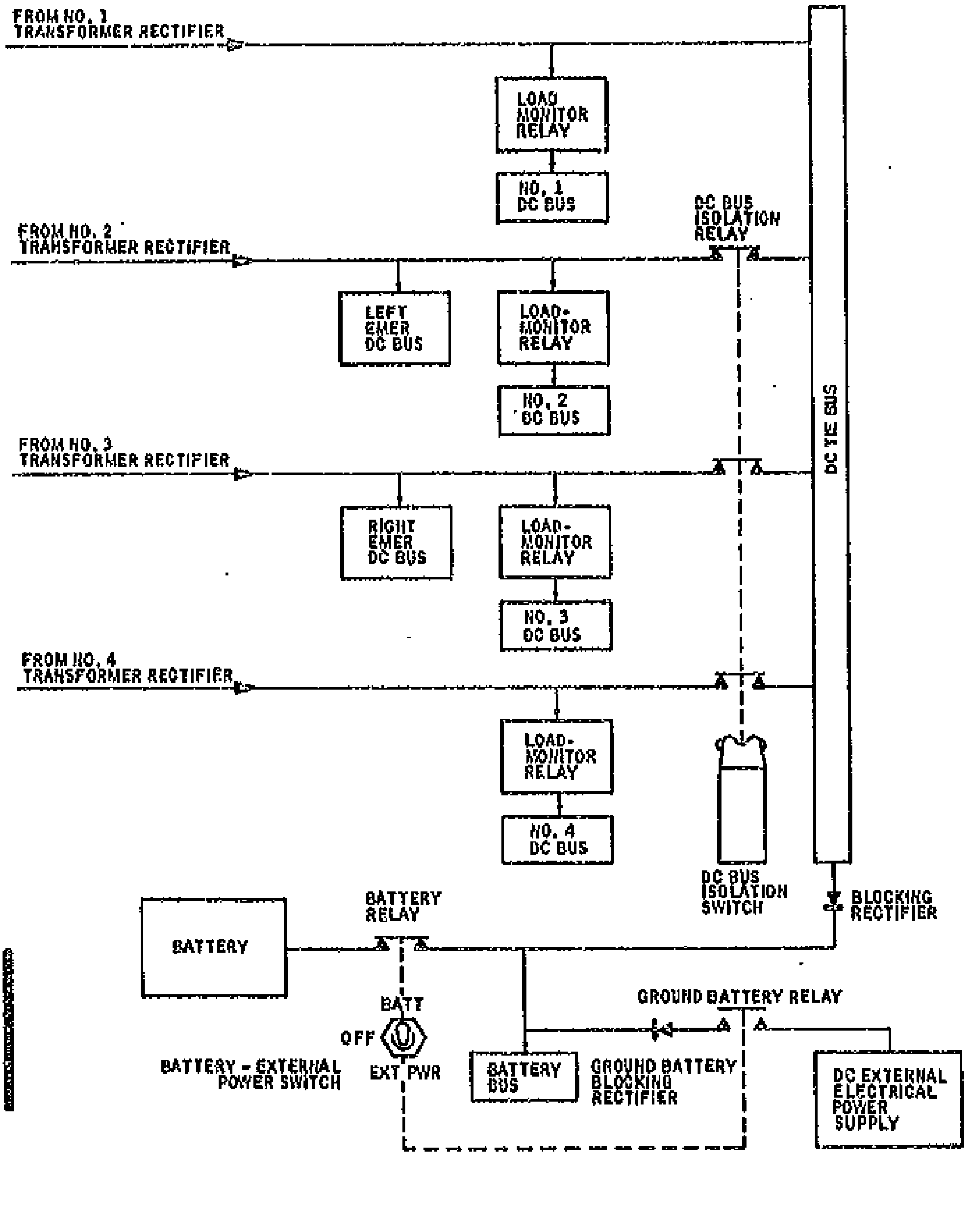
I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

J. An external power receptacle enables the connection of a 400-cycle, 3-phase, 120/208-volt external power source to energize the airplane electrical circuits.

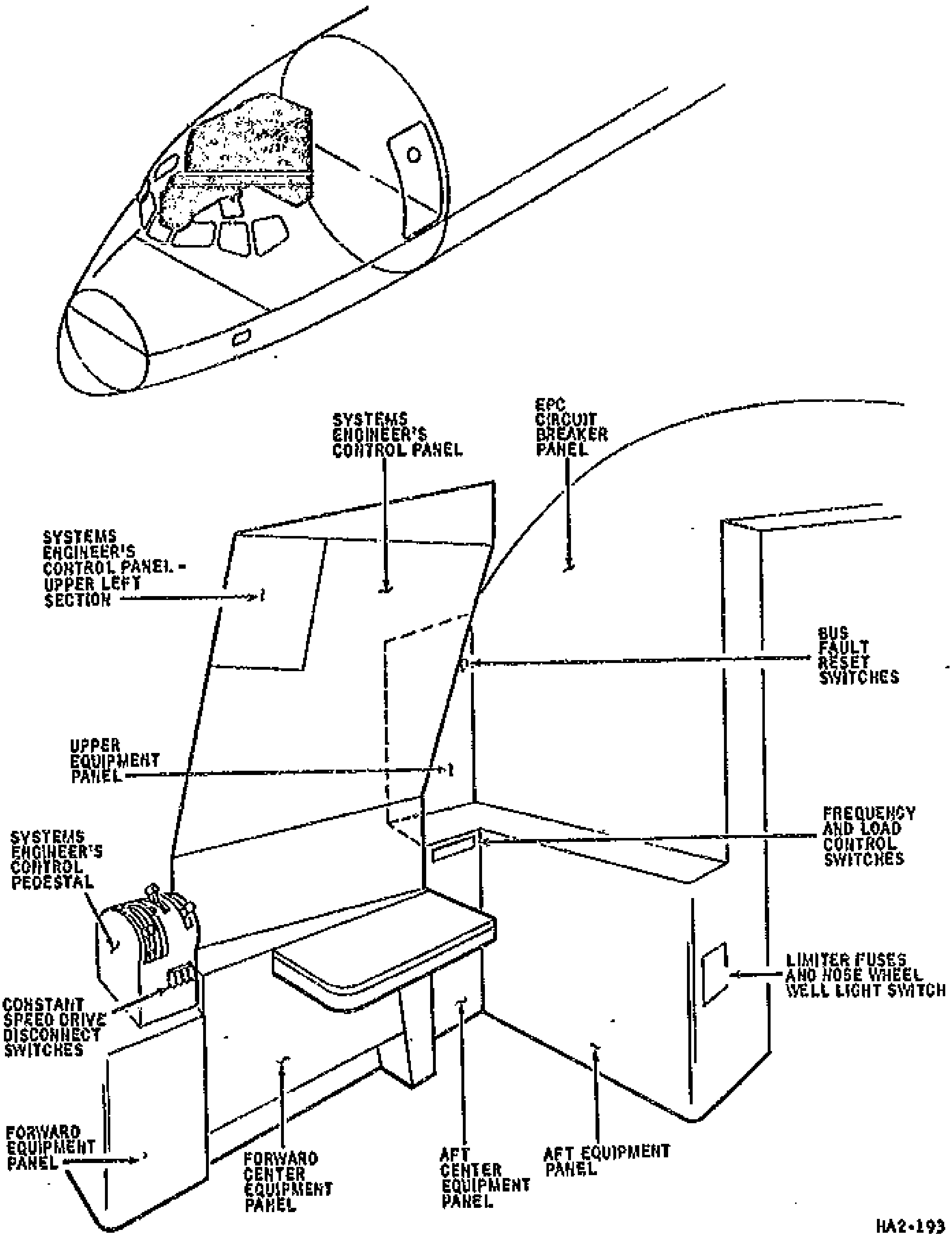
2. Controls and Indications (See Figure 4.)

A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contains the controls and indications for the individual systems used on the airplane.

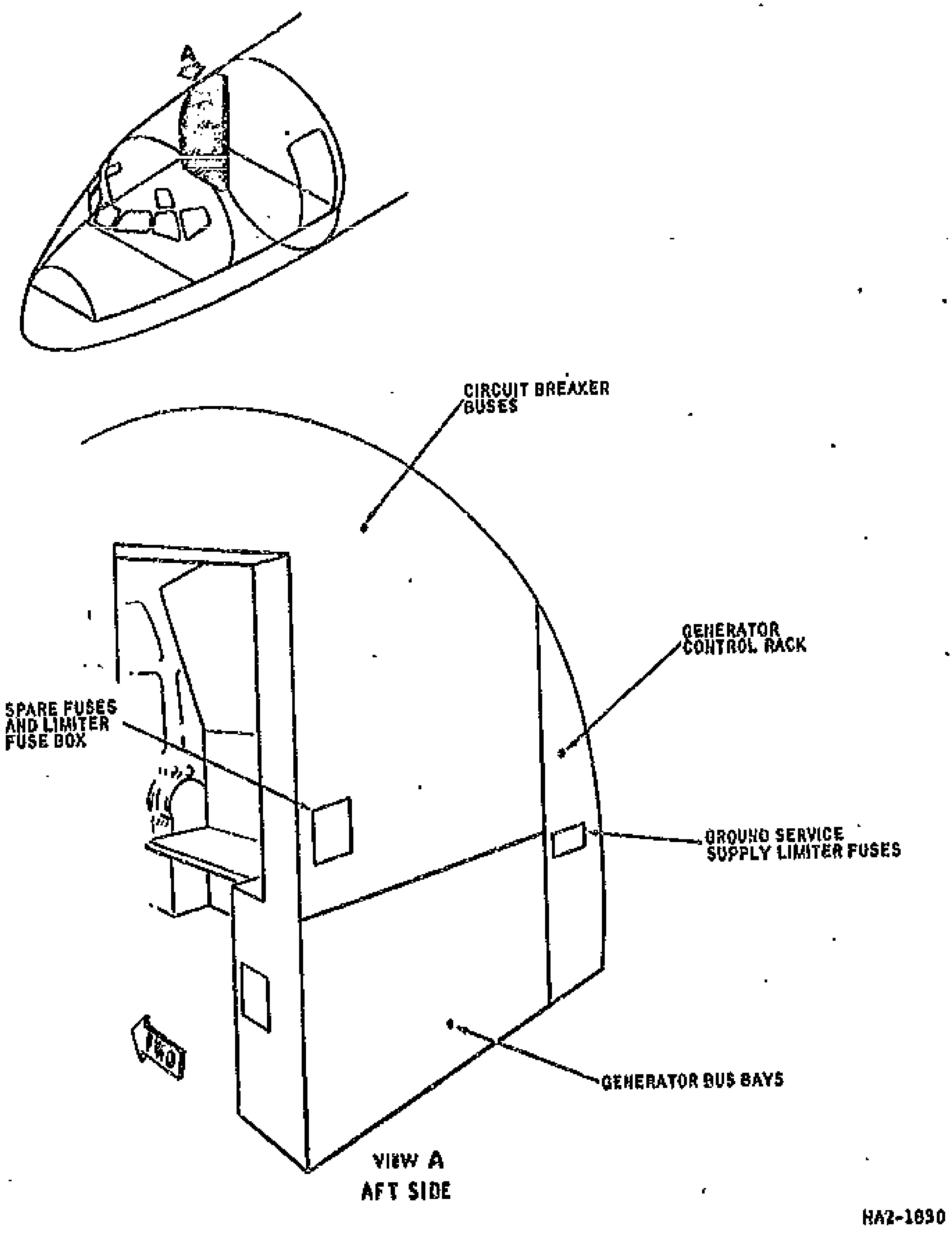
B. Bus fault reset switches are located on the upper equipment panel. The aft center equipment panel contains the frequency and load control switches. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.



Dc Power Distribution -- Block Diagram
Figure 3



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 1)



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 2)

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the section of the systems engineer's control panel (see Figure 5).

3. Electrical Power Limitations

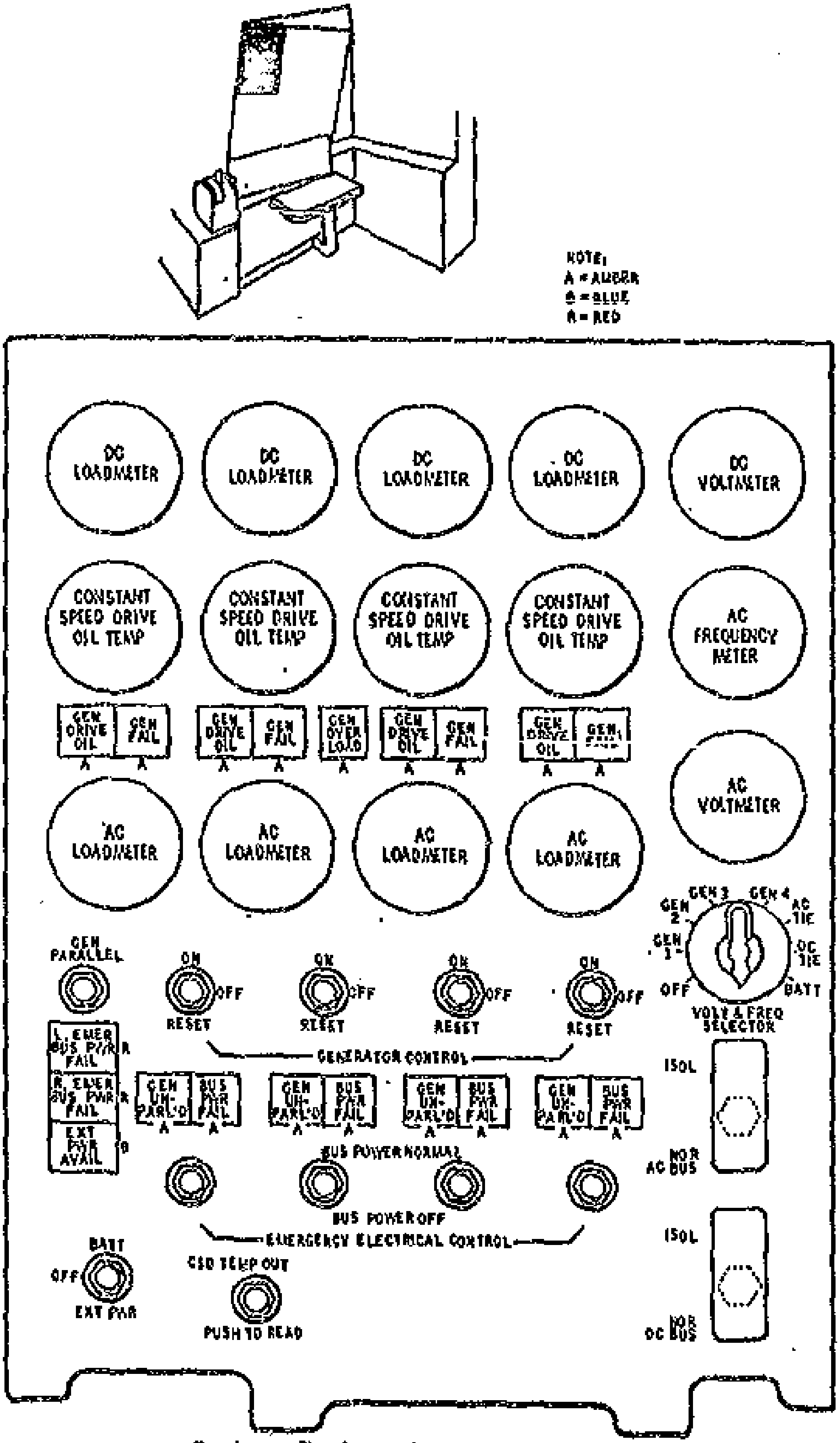
A. The values shown in the normal column are normal operating ranges. Indications outside the normal range indicate possible system abnormalities.

B. Limits shown in the allowable column should not be exceeded, and sustained operation at these limits is not recommended.

CAUTION: DAMAGE TO ELECTRICAL EQUIPMENT OF AIRPLANE IS POSSIBLE IF AC ELECTRICAL SYSTEMS HAVE BEEN SUBJECTED TO VOLTAGES HIGHER THAN 130 VOLTS, PHASE-TO-NEUTRAL, OR 225 VOLTS, PHASE-TO-PHASE, DUE TO ANY MISADJUSTMENT OF EXTERNAL POWER SUPPLY. ANY AC OVER-VOLTAGE APPLIED TO TRANSFORMER-RECTIFIERS WILL RESULT IN DC OVERVOLTAGE BEING APPLIED TO DC EQUIPMENT. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

CAUTION: ANY CONDITION THAT CAUSES ANY INDICATION IN ALLOWABLE COLUMN, OTHER THAN WITHIN NORMAL RANGE, SHOULD BE CORRECTED AT EARLIEST OPPORTUNITY.

	Normal	Allowable	
	Min or Max	Min	Max
Ac voltmeter (external power or generator operation see NOTE 1)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus see NOTE 1)	396 to 404 cps	380 cps	420 cps
Frequency meter (generator operation)	398 to 402 cps	380 cps	420 cps
Dc voltmeter (battery operation)	Not less than 24 volts	22 volts	
Dc voltmeter (external power or generator operation)	25 to 29 volts	24 volts	30 volts



MAI-1940

Systems Engineer's Control Panel -
Upper Left Section
Figure 5

	Normal	Allowable	
	Min or Max	Min	Max
Ac loadmeter (paralleled flight operation)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.0
Ac loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0.		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37.		
Dc loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load.	Zero	1.3

	Normal	Allowable	
	Min or Max	Min	Max
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

   A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208-volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

   B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant speed drive (CSD) transmission. Frequency is normally maintained at 400 (±0.1) cps by a frequency and load control panel which transmits signals to the magnetic trim head of the CSD transmission speed governor, thus correcting CSD output speed to maintain 400 (±0.1) cps. If the CSD transmission is operating on the speed governor, without the fine frequency control of the frequency and load control panel, the frequency is maintained at 400 (±4) cps.

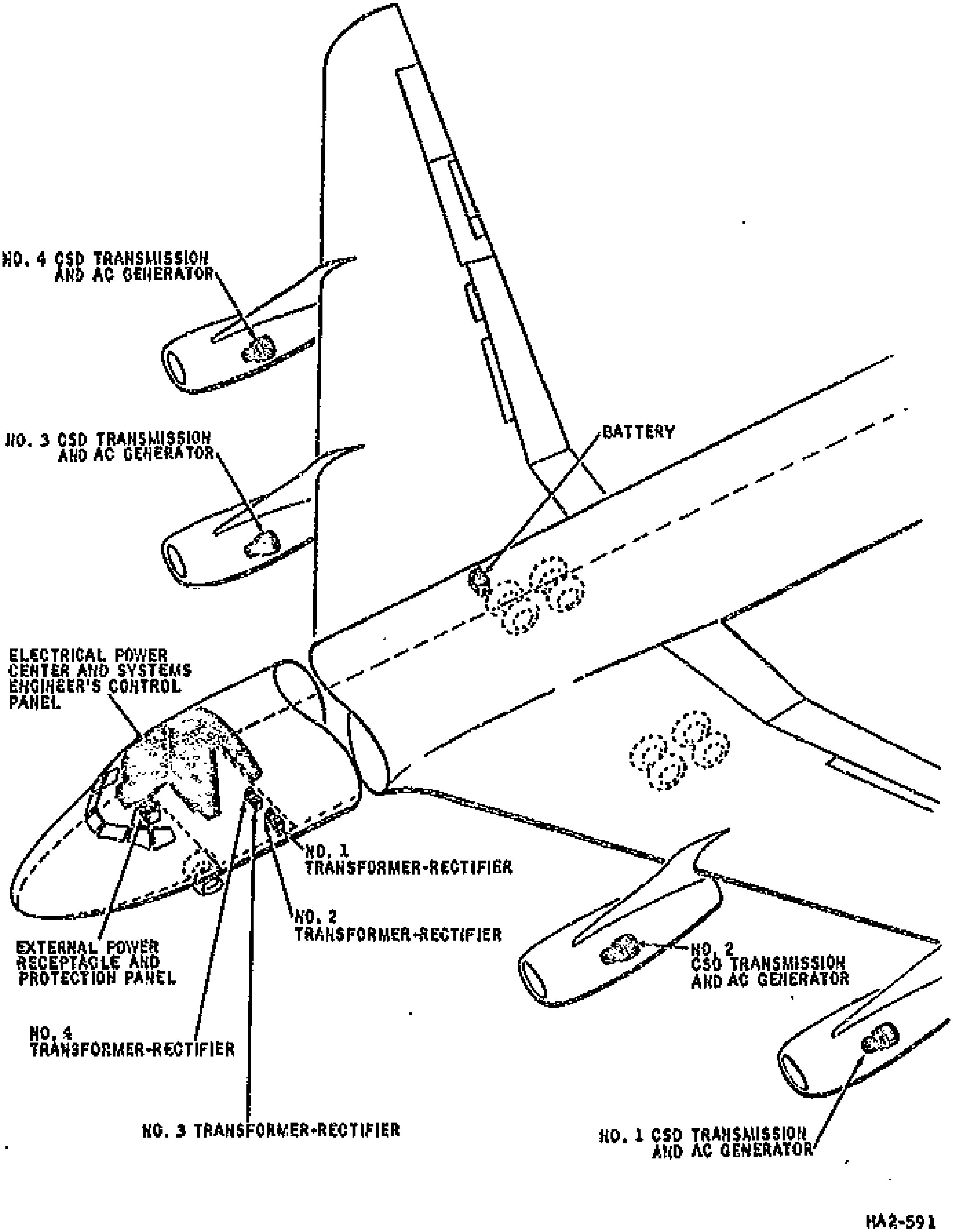
   C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

   D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus, and the No. 3 generator bus is connected directly to the right ac emergency bus.

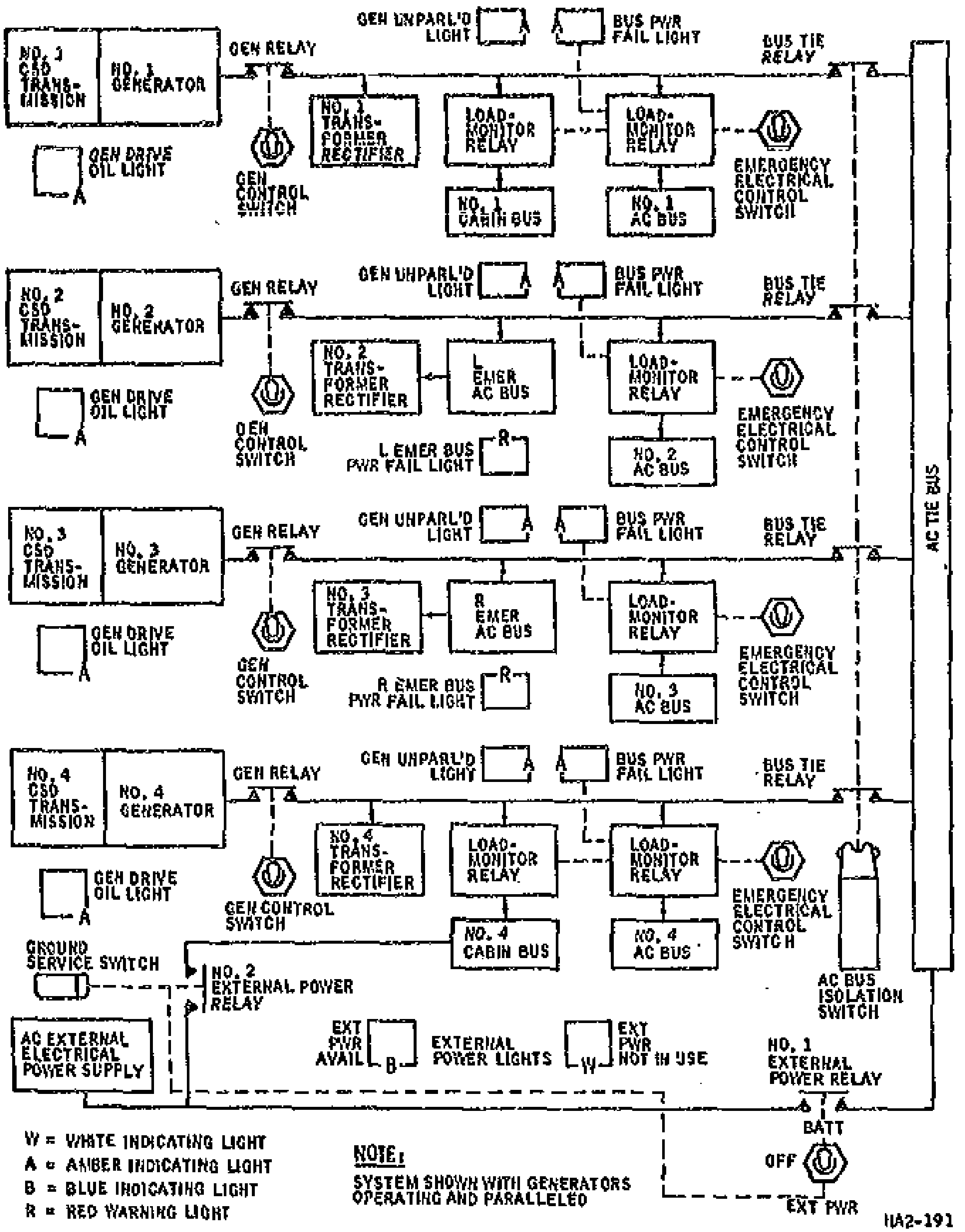
   E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

   F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.

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Electrical Power System Installations
Figure 1



Ac Power Distribution -- Block Diagram
Figure 2

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

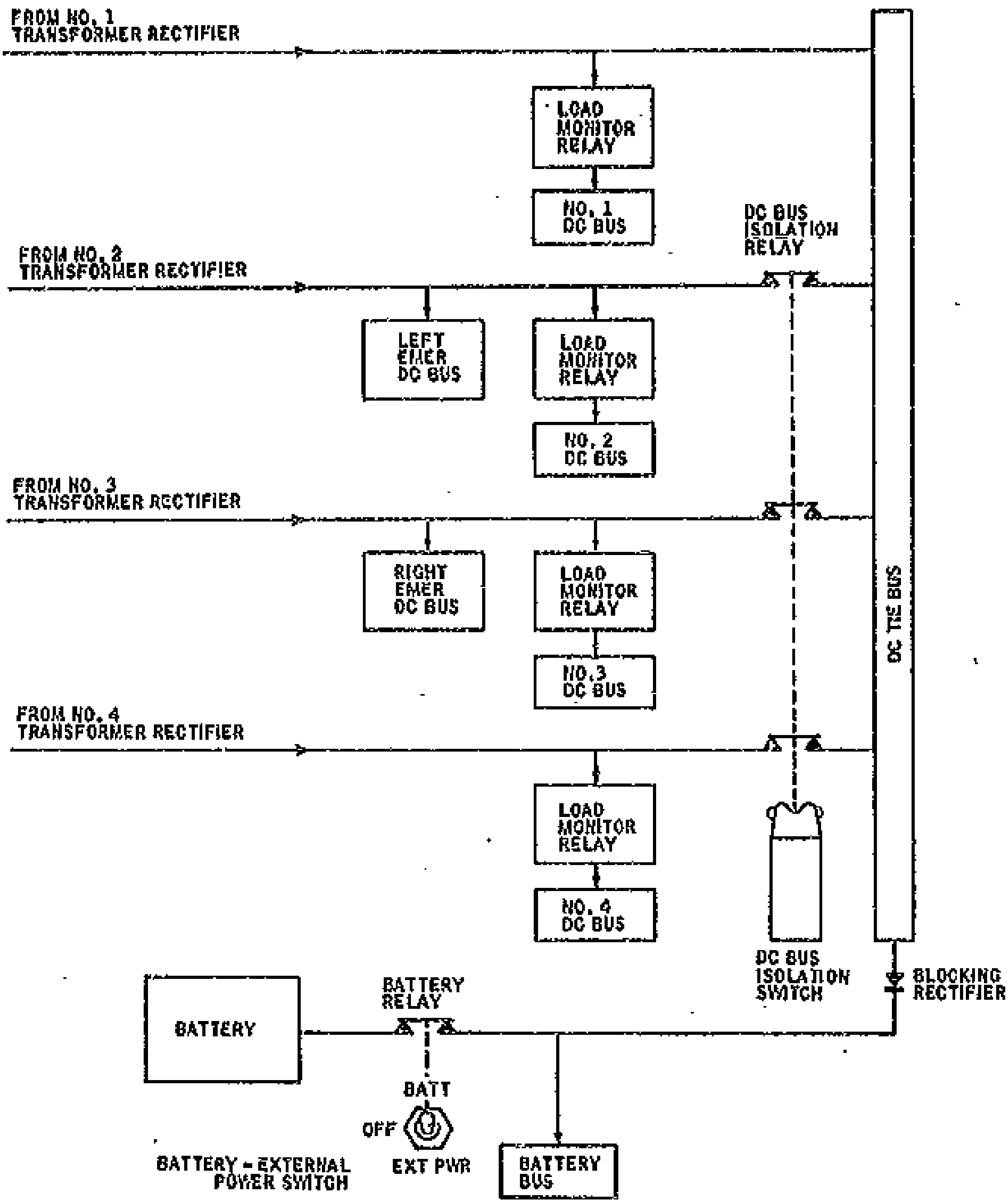
I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

J. An external power receptacle enables the connection of a 400-cycle, 3-phase, 120/208-volt external power source to energize the airplane electrical circuits.

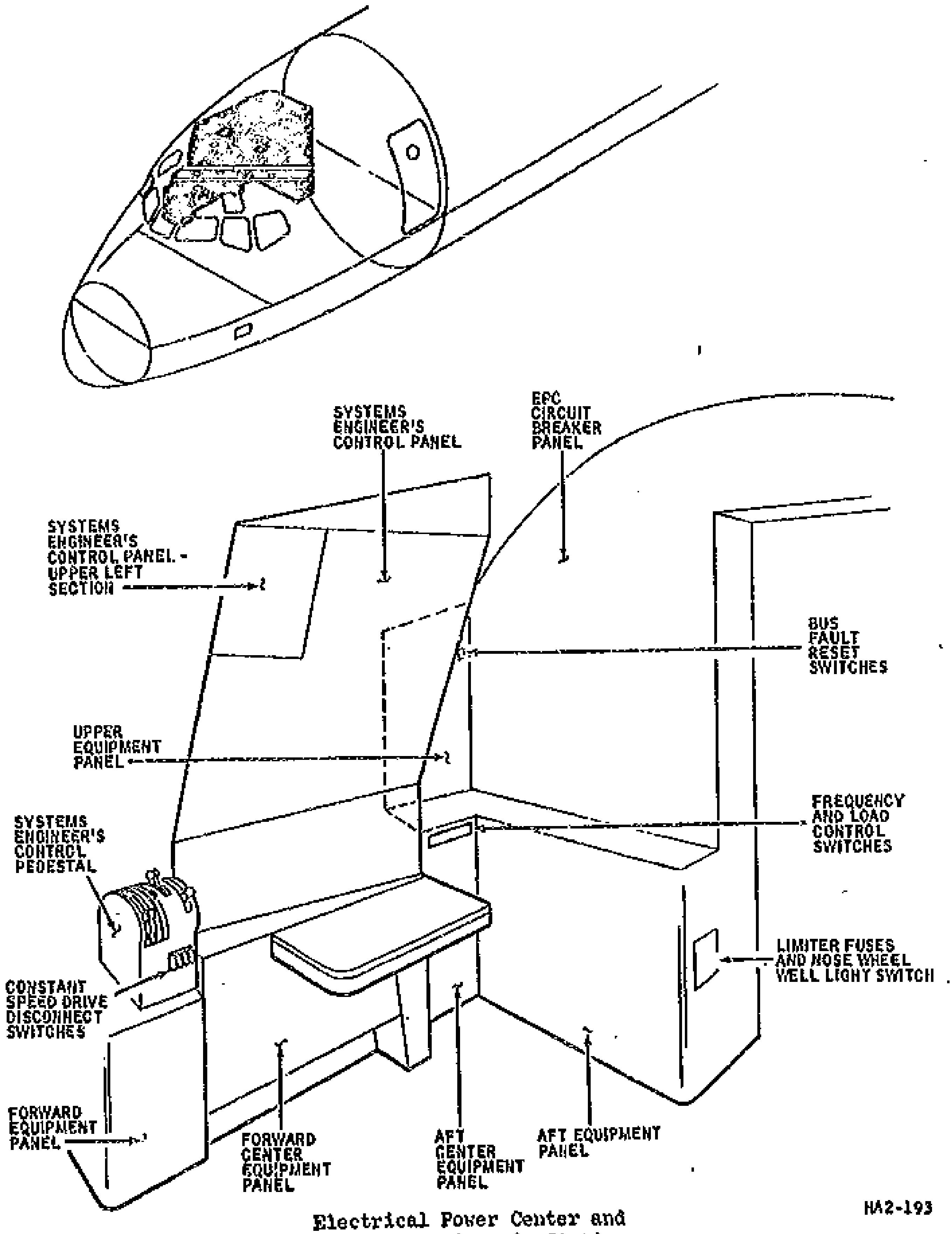
2. Controls and Indications (See Figure 4.)

A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contain the controls and indications for the individual systems used on the airplane.

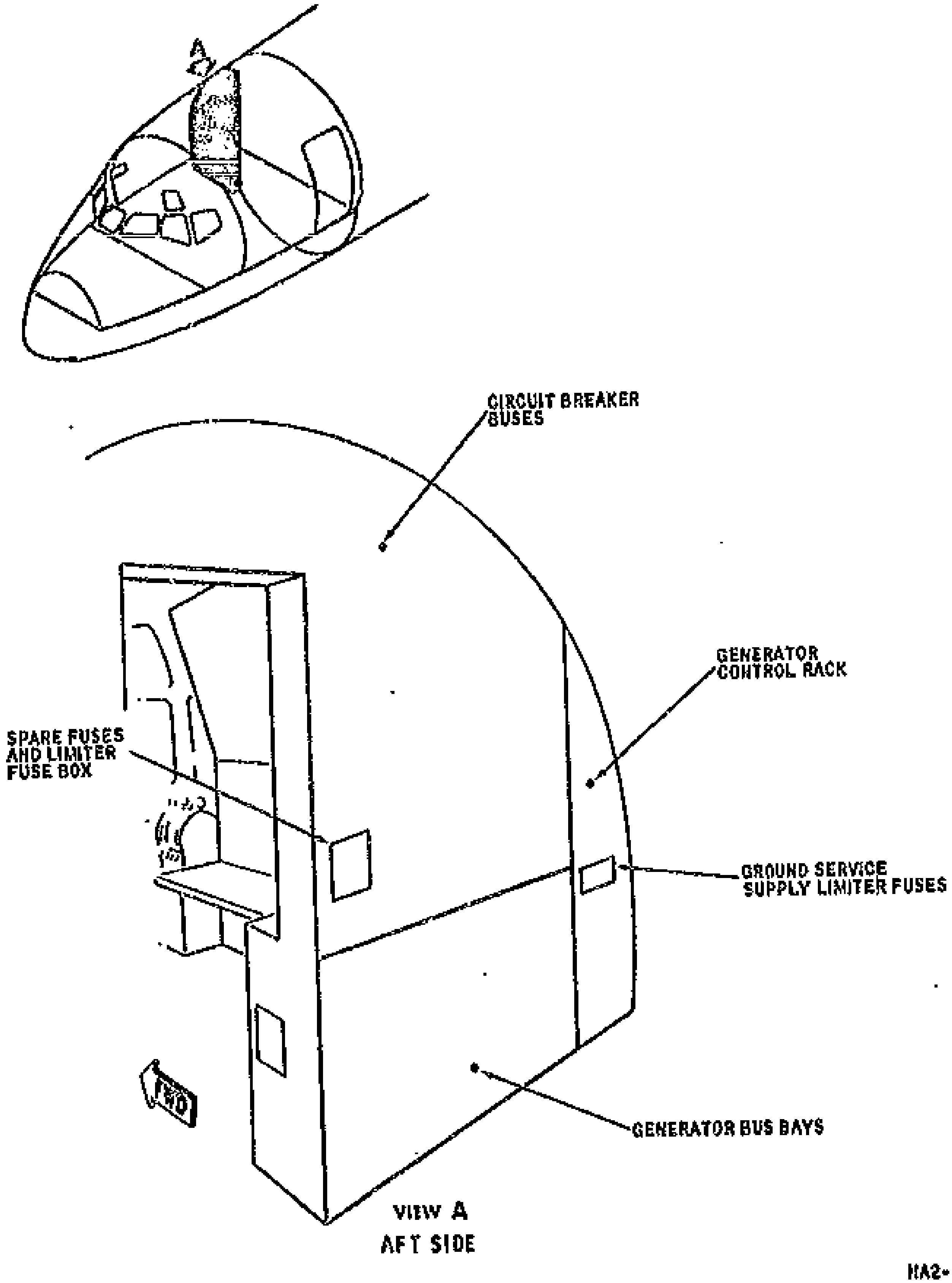
B. Bus fault reset switches are located on the upper equipment panel. The aft center equipment panel contains the frequency and load control switches. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.



Dc Power Distribution -- Block Diagram
Figure 3



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 1)



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 2)

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the systems engineer's control panel (see Figure 5).

3. Electrical Power Limitations

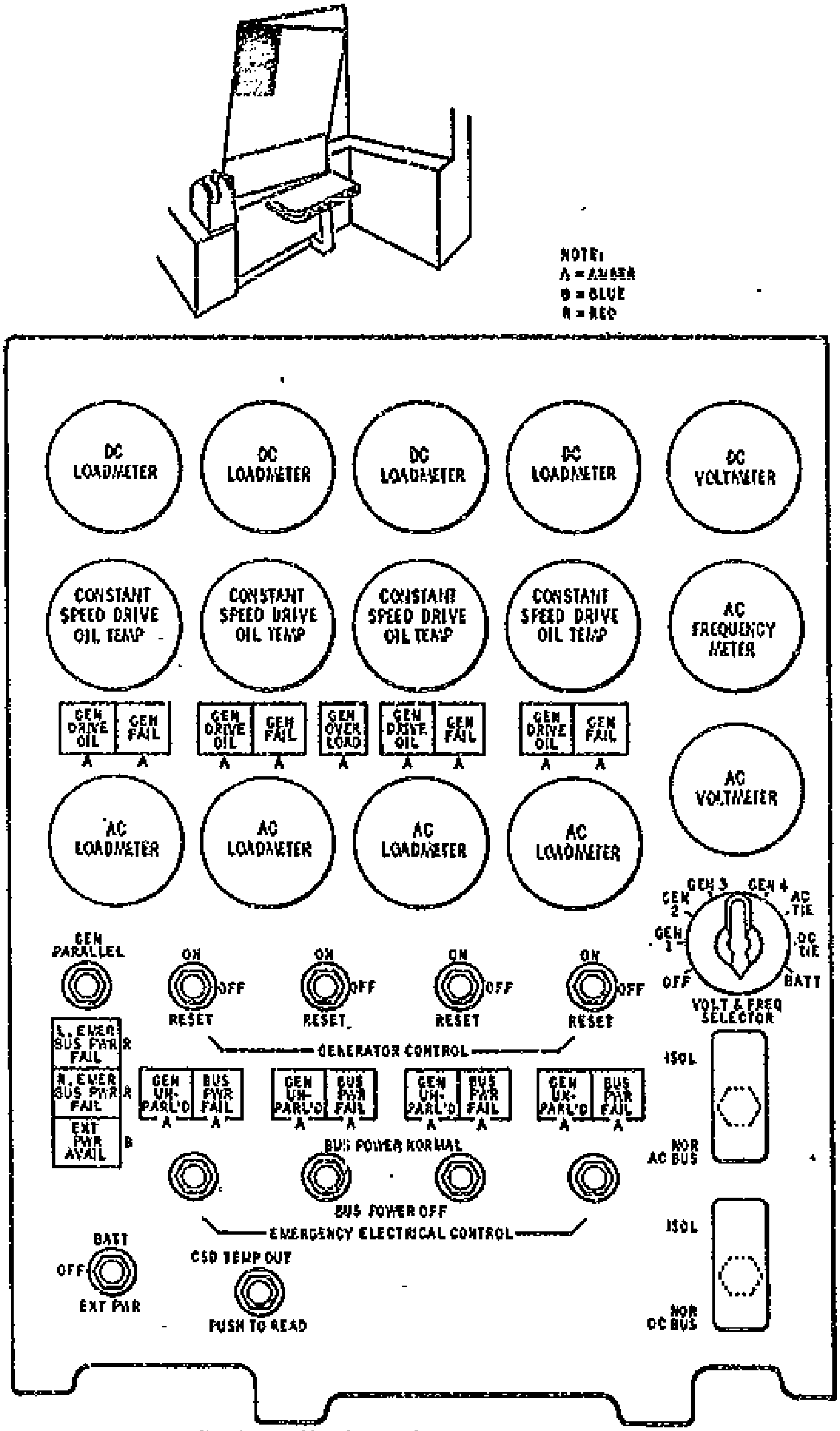
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	Normal	Allowable	
	Min or Max	Min	Max
Ac voltmeter (external power or generator operation see NOTE 1)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus see NOTE 1)	396 to 404 cps	380 cps	420 cps
Frequency meter (generator operation)	398 to 402 cps	380 cps	420 cps
Dc voltmeter (battery operation)	Not less than 24 volts	22 volts	



Systems Engineer's Control Panel --
Upper Left Section
Figure 5

	Normal	Allowable	
	Min or Max	Min	Max
Dc voltmeter (external power or generator operation)	25 to 29 volts	24 volts	30 volts
Ac loadmeter (paralleled flight operation)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.0
Ac loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0 .		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37.		
Dc loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load .	Zero	1.3

	Normal	Allowable	
	Min or Max	Min	Max
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

   A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208 volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

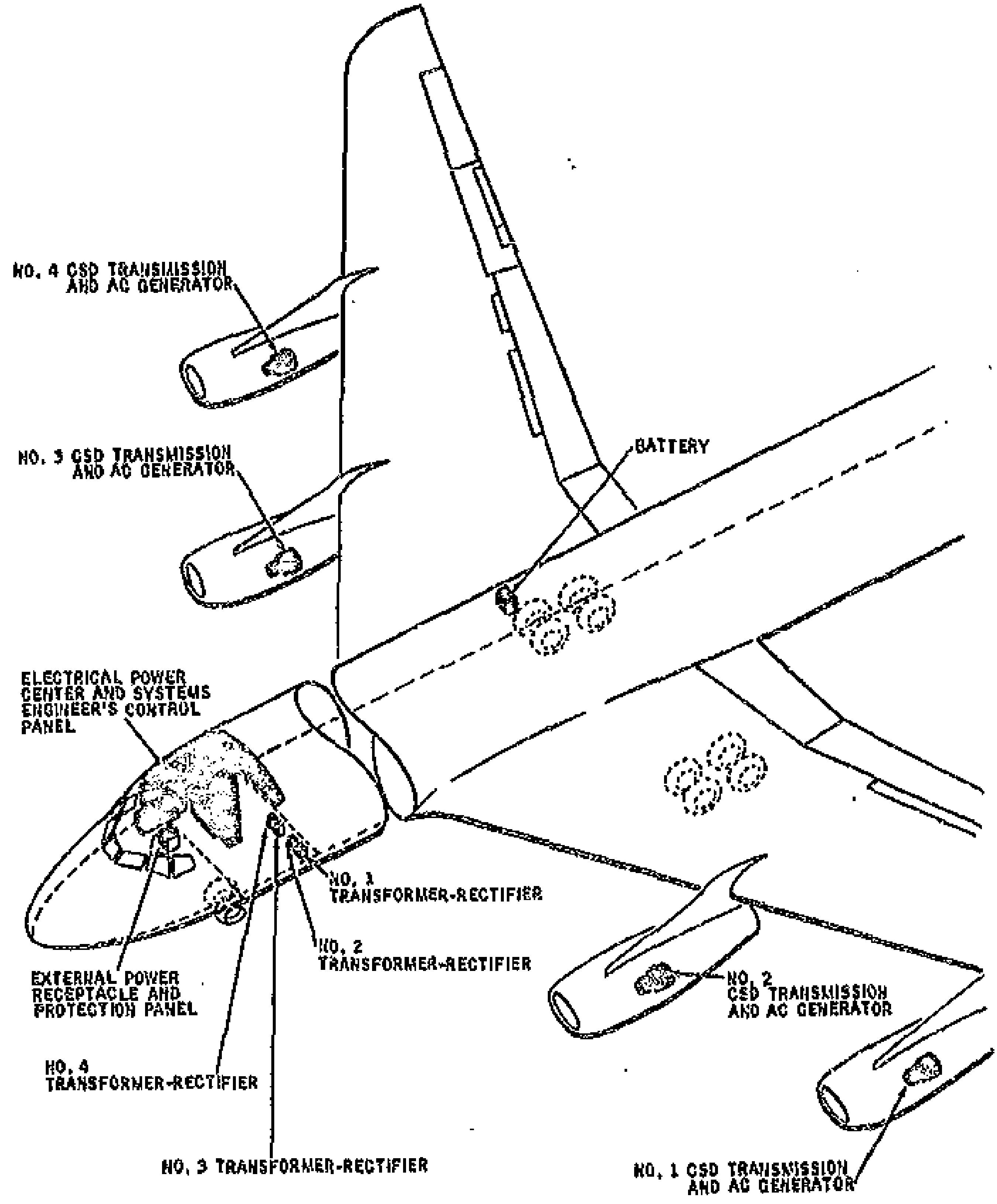
   B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant speed drive (CSD) transmission. Frequency is maintained at 400 (±4) cps by the CSD transmission speed governor.

   C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

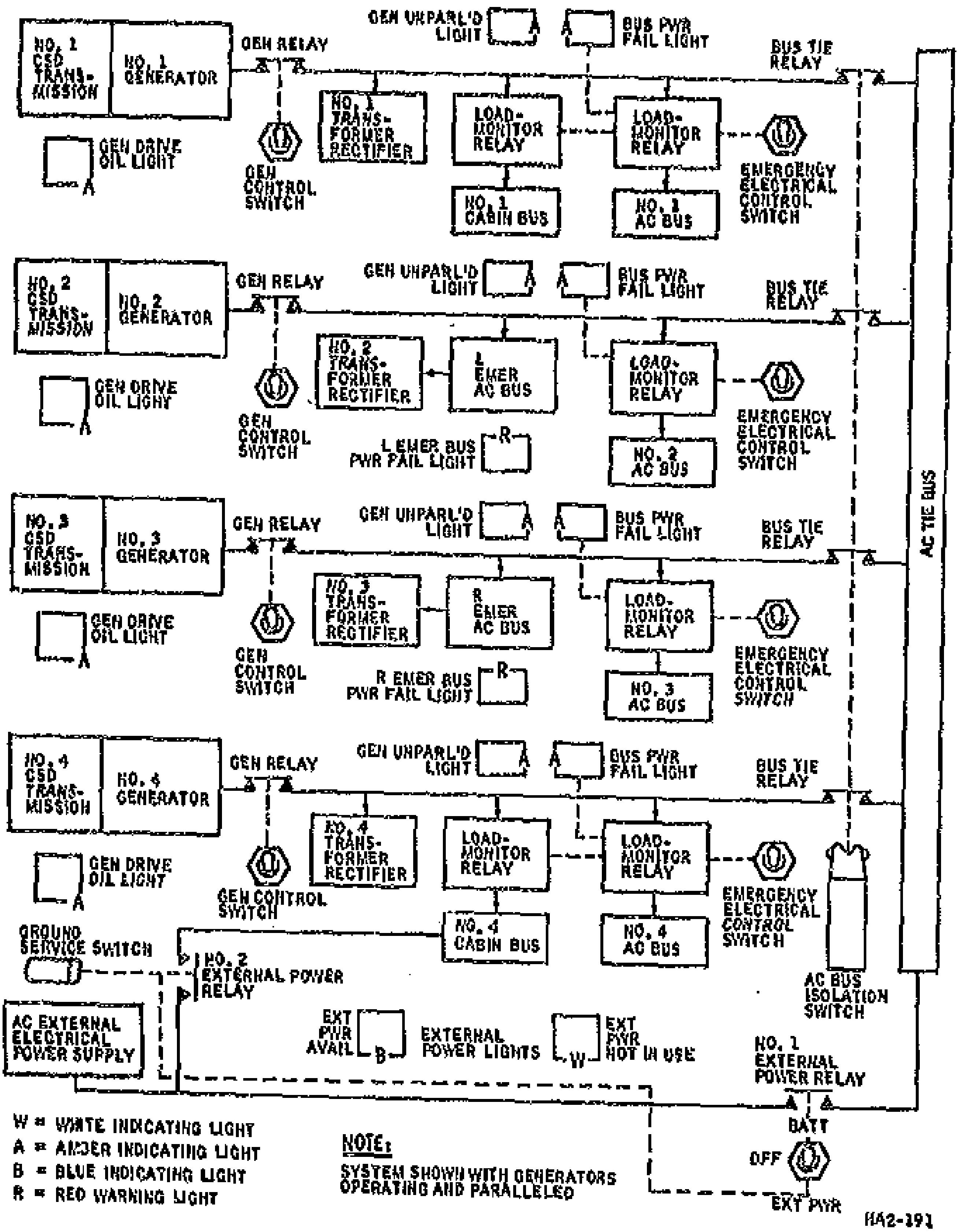
   D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus, and the No. 3 generator bus is connected directly to the right ac emergency bus.

   E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

   F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.



Electrical Power System Installations
Figure 1



Ac Power Distribution -- Block Diagram
Figure 2

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transfo.mer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

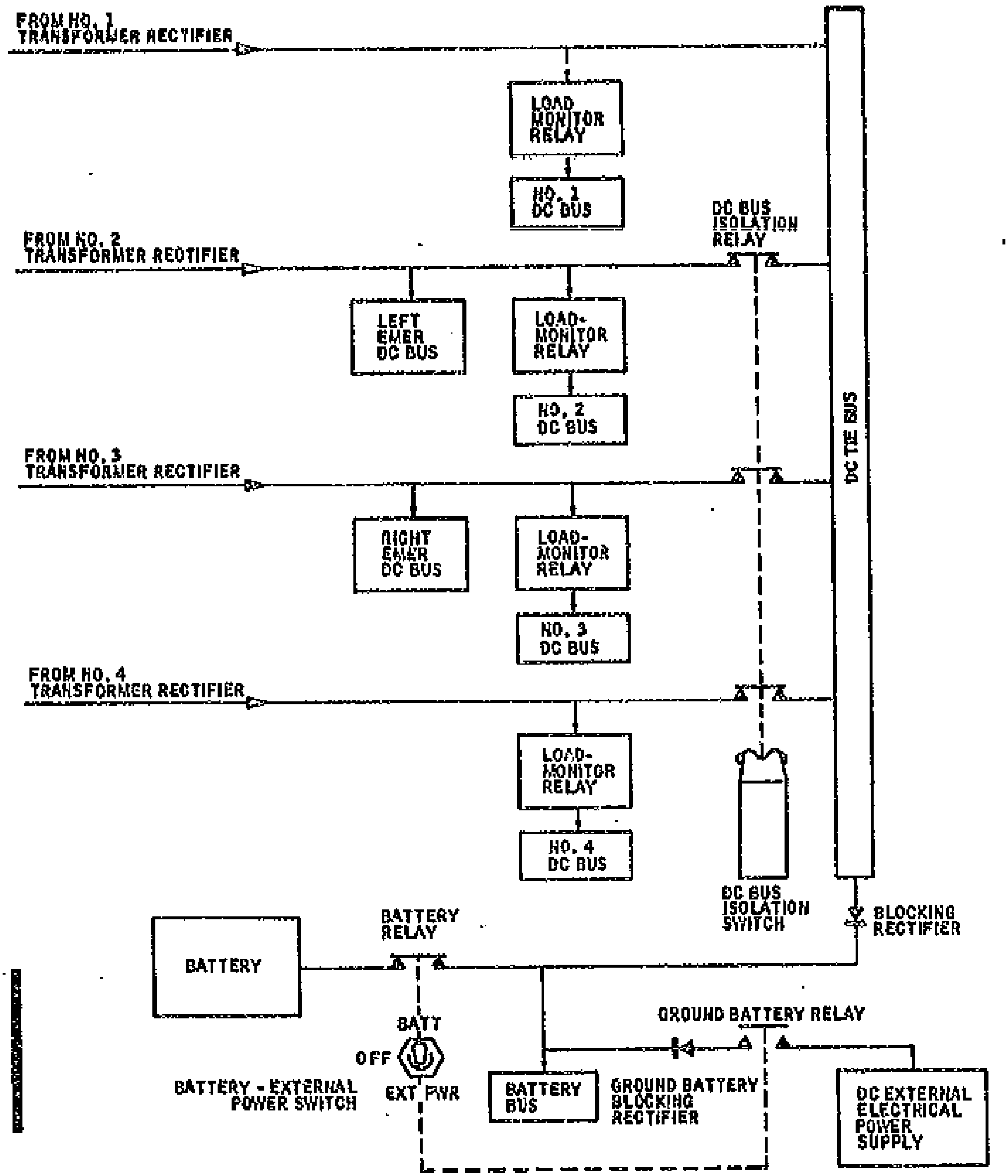
H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

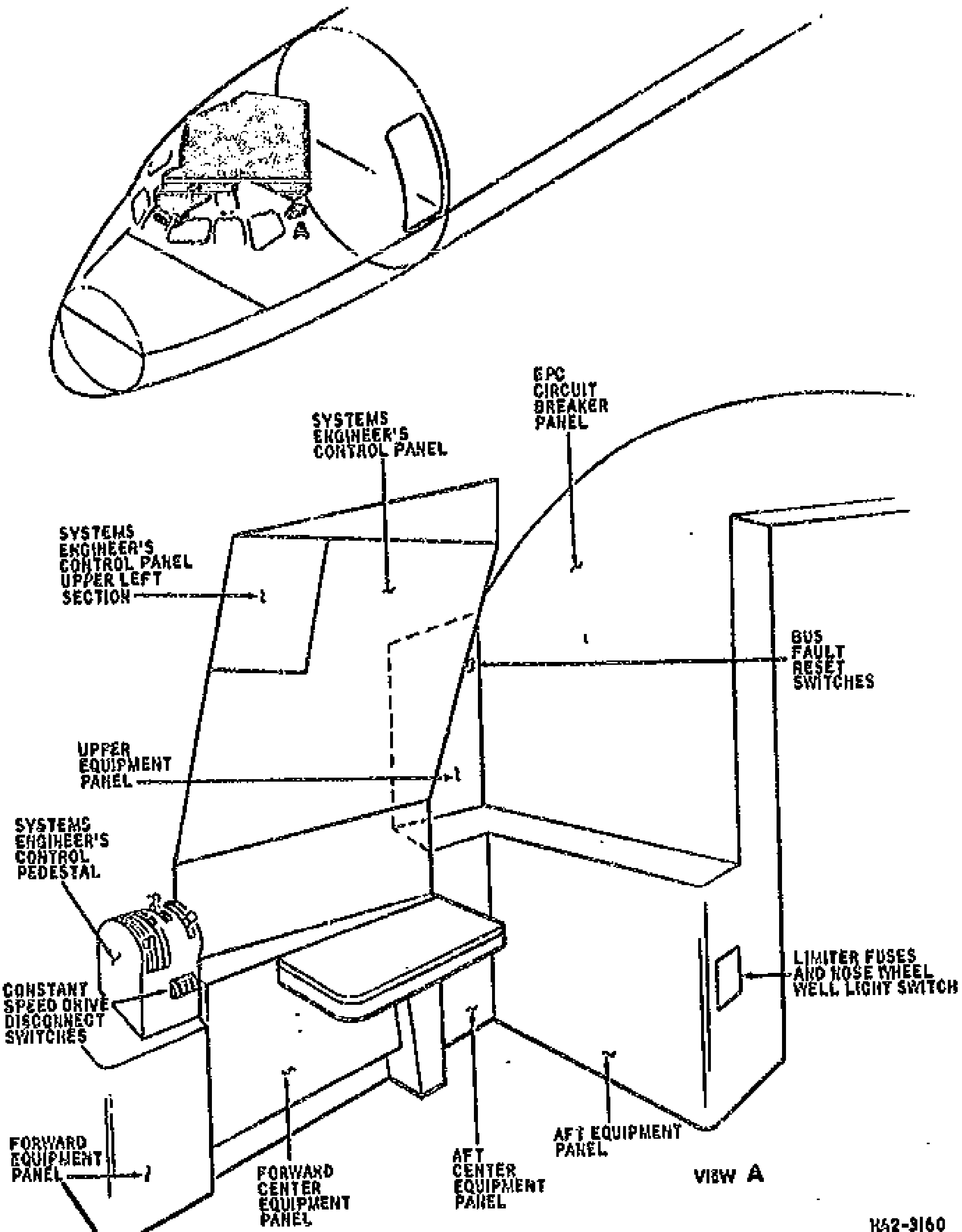
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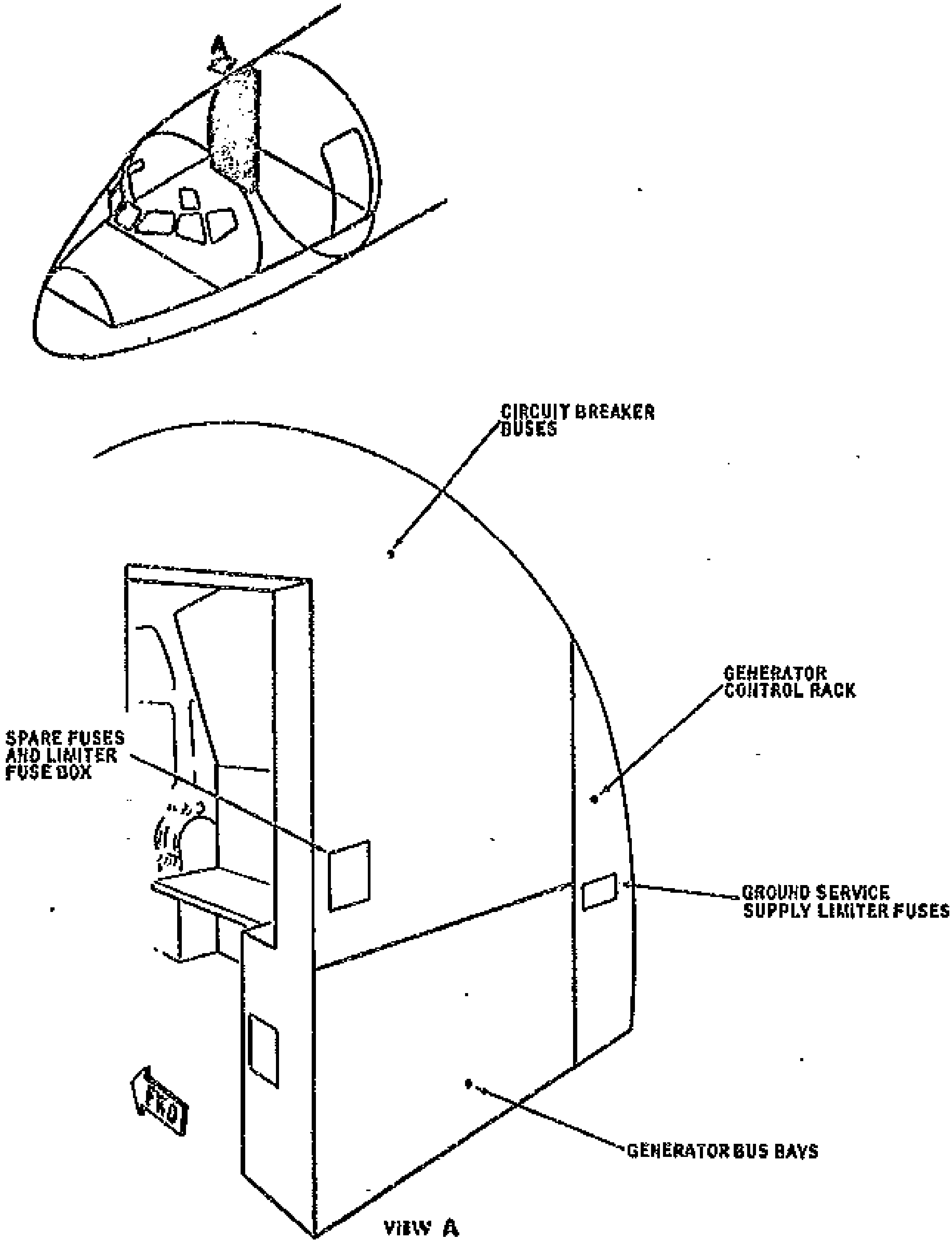
A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contains the controls and indications for the individual systems used on the airplane.



Dc Power Distribution -- Block Diagram
Figure 3



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 1)



VIEW A
AFT SIDE

HA2-1830

Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 2)

B. Bus fault reset switches are located on the upper equipment panel. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the systems engineer's control panel (see Figure 5).

3. Electrical Power Limitations

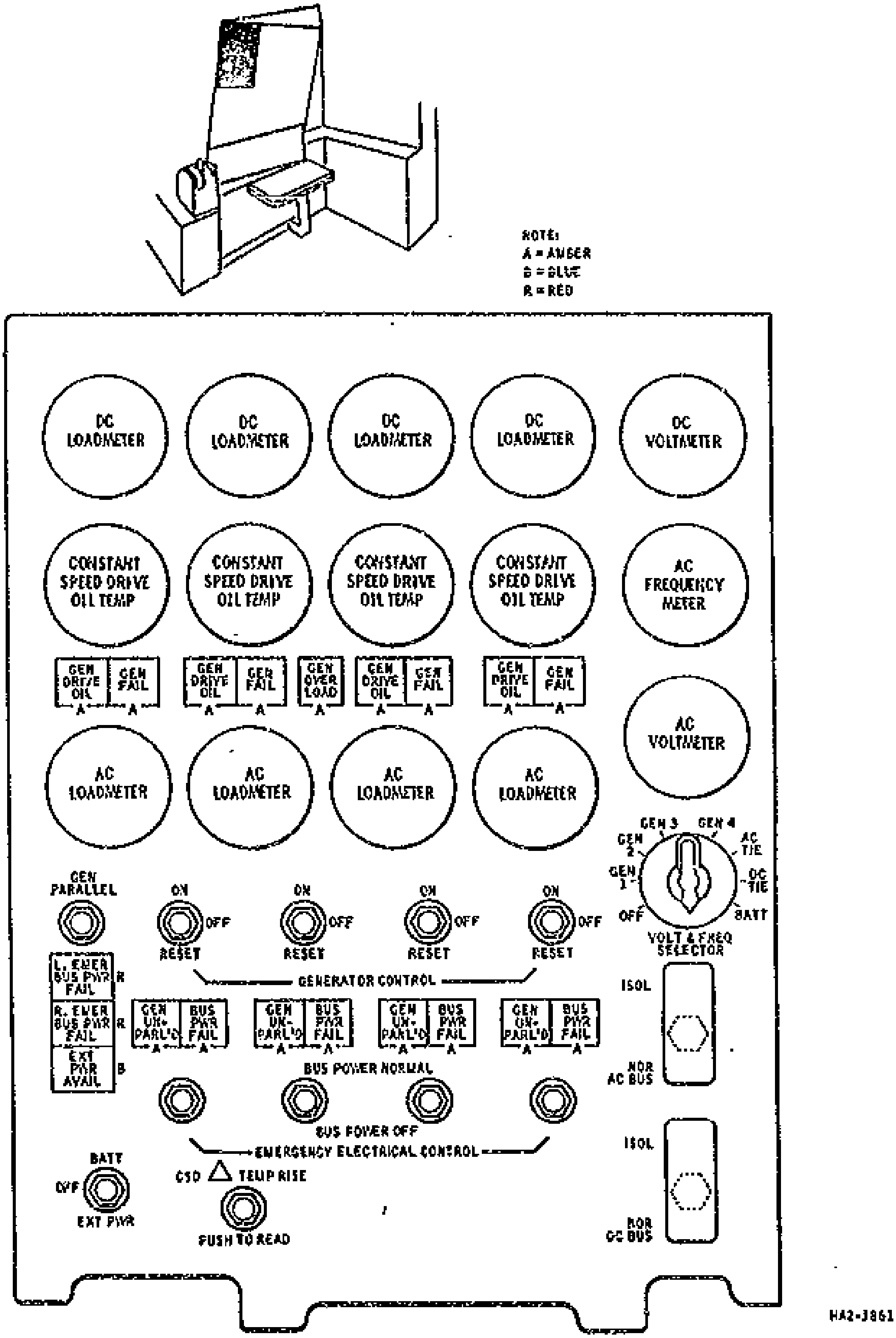
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	Normal	Allowable	
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Systems Engineer's Control Panel -- Upper Left Section
Figure 5

	Normal	Allowable	
	Min or Max	Min	Max
Dc voltmeter (battery operation)	Not less than 24 volts	22 volts	
Dc voltmeter (external power or generator operation)	25 to 29 volts	24 volts	30 volts
Ac loadmeter (paralleled flight operation)	With ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.0
Ac loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0.		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37.		
Dc loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load.	Zero	1.3

	Normal	Allowable	
	Min or Max	Min	Max
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

   A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208-volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

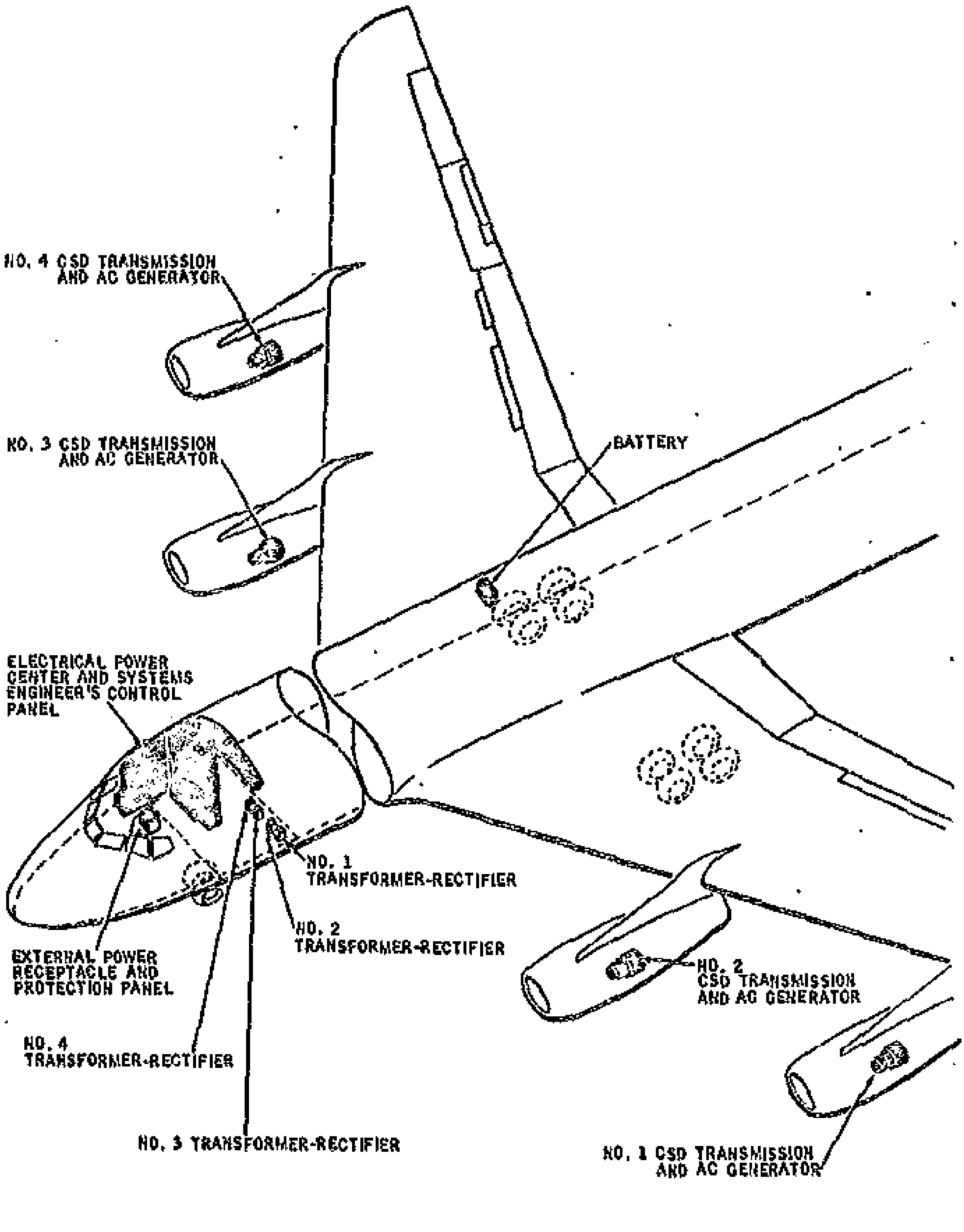
   B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant speed drive (CSD) transmission. Frequency is maintained at 400 (±4) cps by the CSD transmission speed governor.

   C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

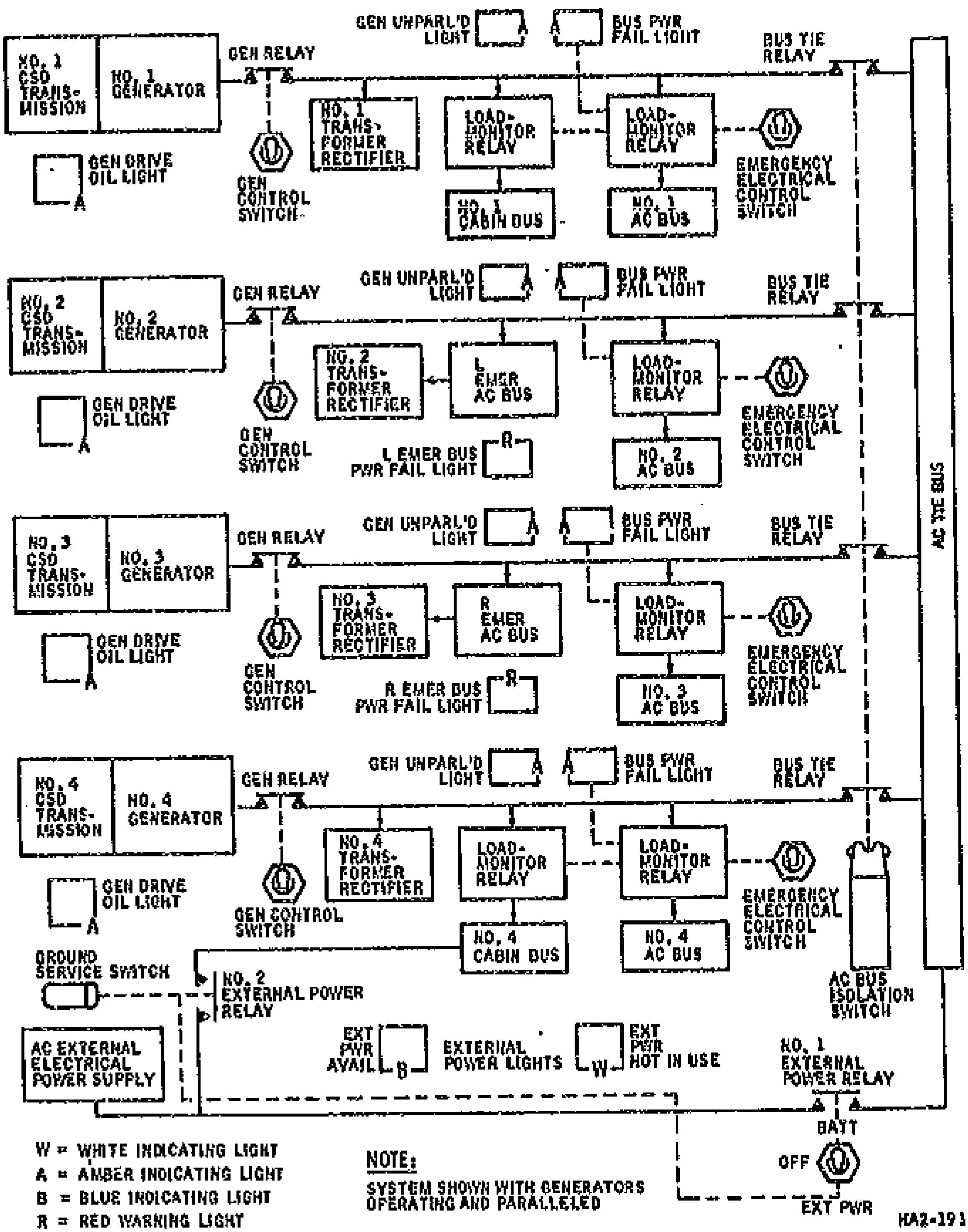
   D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the right ac emergency bus.

   E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

   F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.



Electrical Power System Installations
Figure 1



Ac Power Distribution -- Block Diagram
Figure 2

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

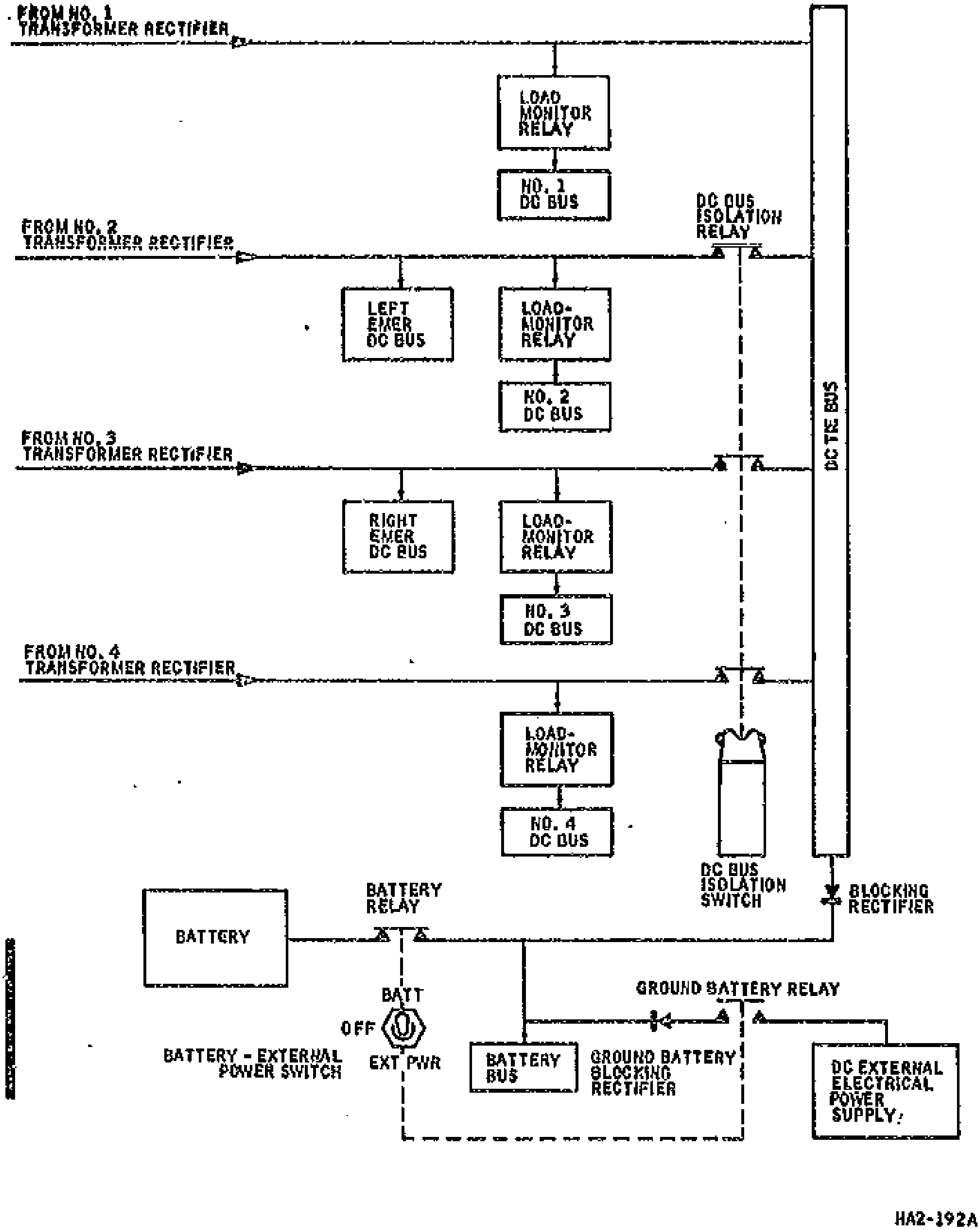
H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency busses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

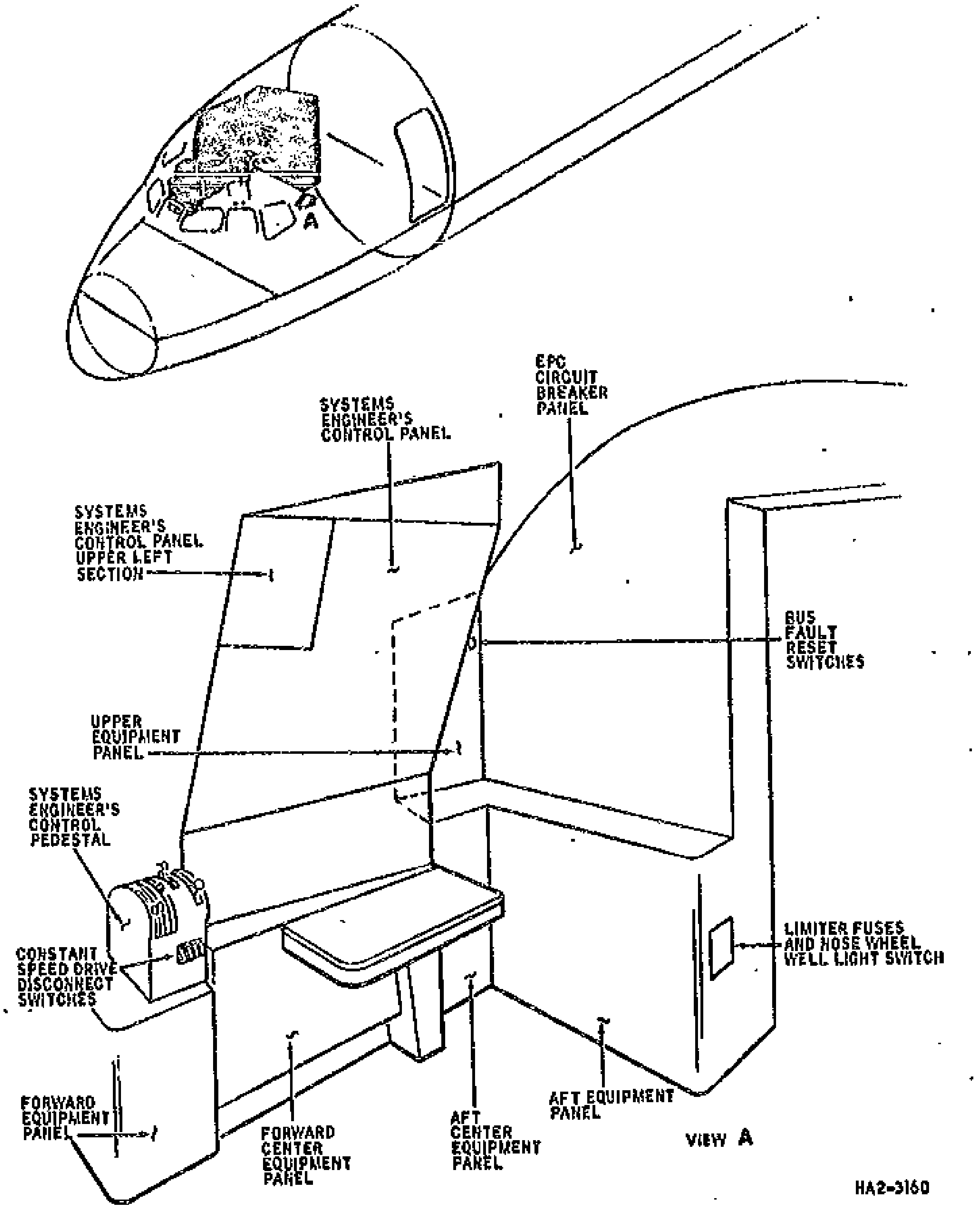
J. An external power receptacle enables the connection of a 400-cycle, 3-phase, 120/208-volt external power source to energize the airplane electrical circuits.

2. <u>Controls and Indications</u> (See Figure 4.)

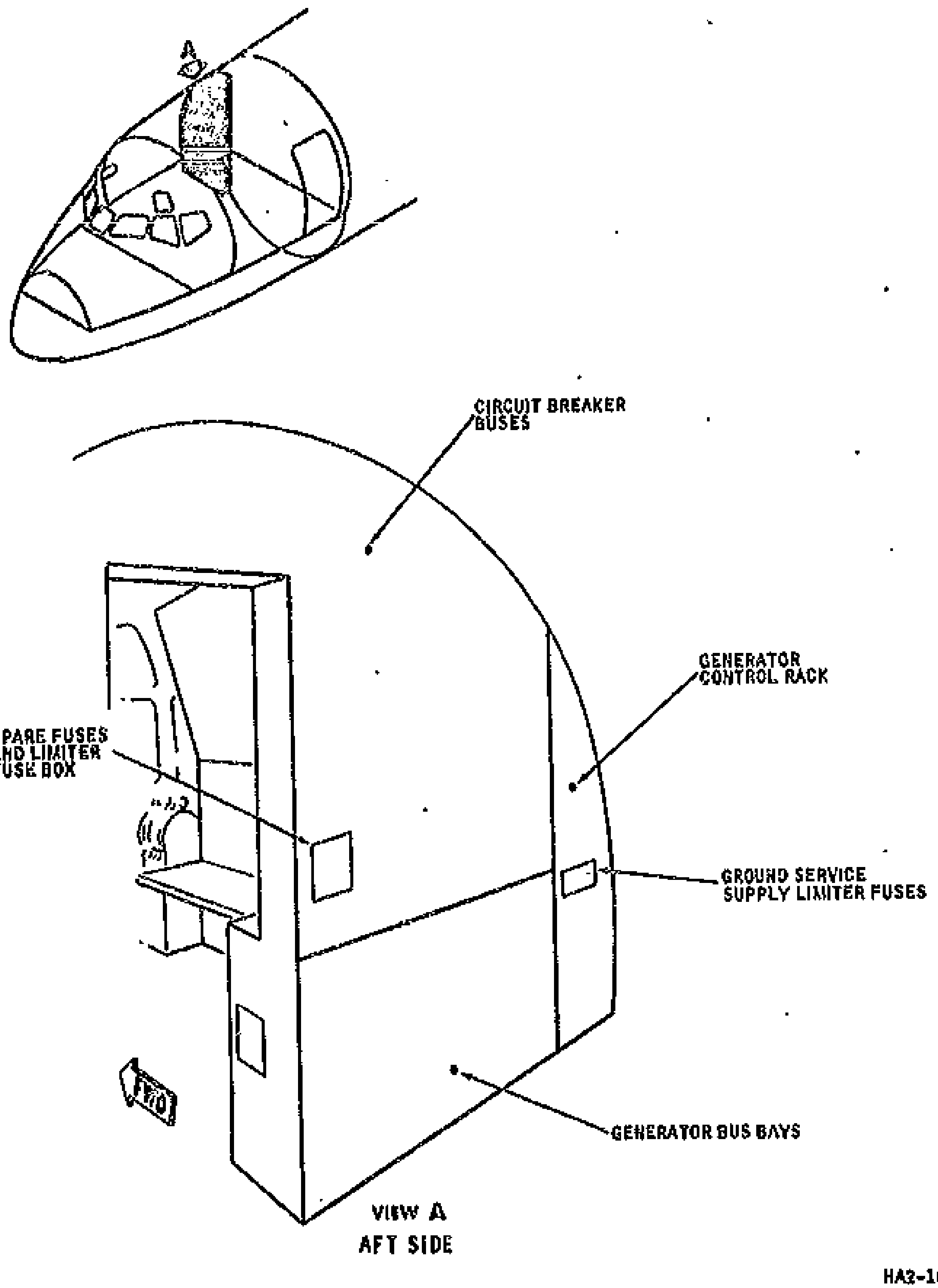
A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contain the controls and indications for the individual systems used on the airplane.



Dc Power Distribution -- Block Diagram
Figure 3



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 1)



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 2)

B. Bus fault reset switches are located on the upper equipment panel. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the systems engineer's control panel (see Figure 5).

3. Electrical Power Limitations

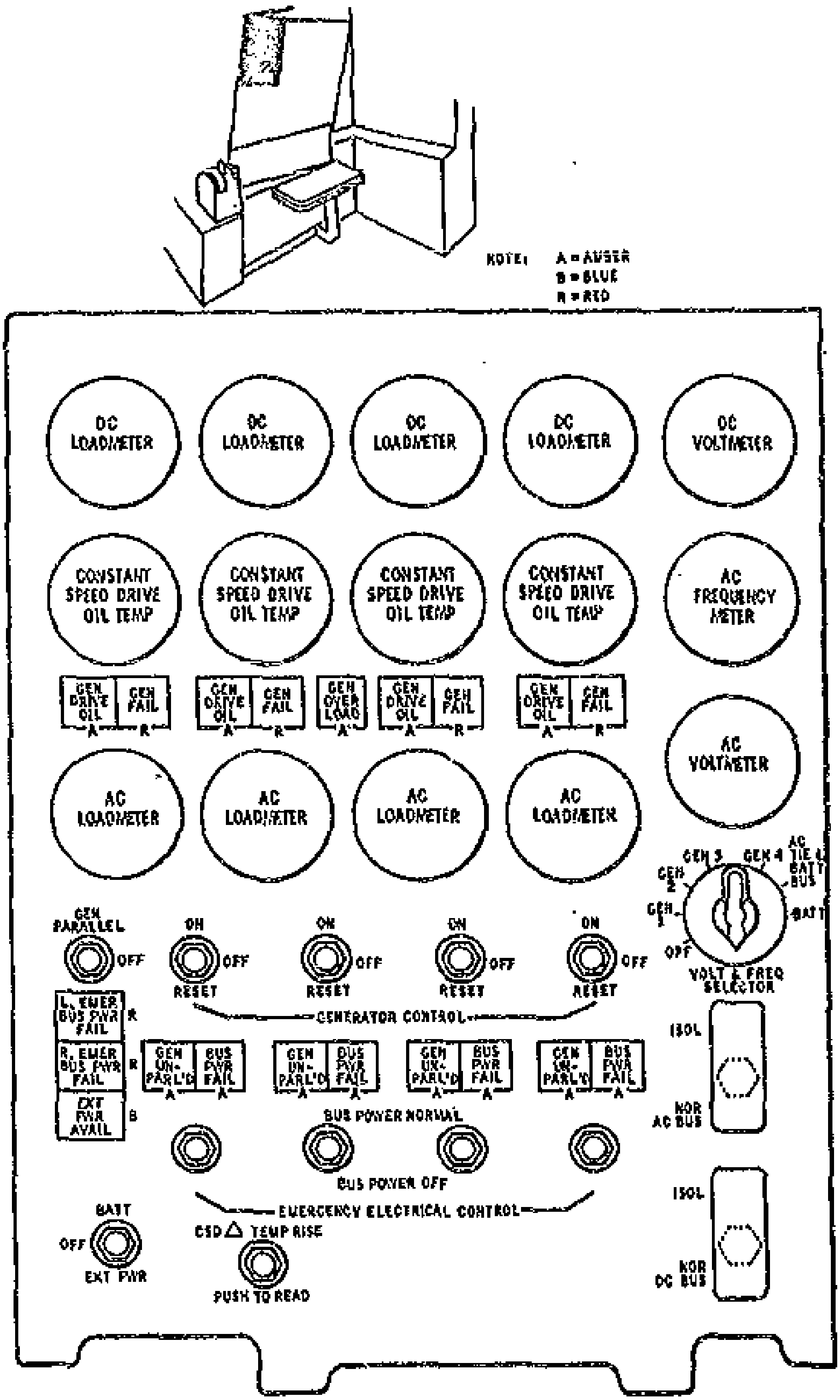
A. The values shown in the normal column are normal operating ranges. Indications outside the normal range indicate possible system abnormalities.

B. Limits shown in the allowable column should not be exceeded, and sustained operation at these limits is not recommended.

CAUTION: DAMAGE TO ELECTRICAL EQUIPMENT OF AIRPLANE IS POSSIBLE IF AC ELECTRICAL SYSTEMS HAVE BEEN SUBJECTED TO VOLTAGES HIGHER THAN 130 VOLTS, PHASE-TO-NEUTRAL, OR 225 VOLTS, PHASE-TO-PHASE, DUE TO MISADJUSTMENT OF EXTERNAL POWER SUPPLY. ANY AC OVERVOLTAGE, APPLIED TO TRANSFORMER-RECTIFIERS WILL RESULT IN DC OVERVOLTAGE BEING APPLIED TO DC EQUIPMENT. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

CAUTION: ANY CONDITION THAT CAUSES ANY INDICATION IN ALLOWABLE COLUMN, OTHER THAN WITHIN NORMAL RANGE, SHOULD BE CORRECTED AT EARLIEST OPPORTUNITY.

	Normal	Allowable	
	Min or Max	Min	Max
Ac voltmeter (external power or generator operation see NOTE 1)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus see NOTE 1)	396 to 404 cps	380 cps	420 cps
Frequency meter (generator operation)	396 to 404 cps	380 cps	420 cps



Systems Engineer's Control Panel -- Upper Left Section
Figure 5

	Normal	Allowable	
	Min or Max	Min	Max
Dc voltmeter (battery operation)	Not less than 24 volts	22 volts	
Dc voltmeter (external power or generator operation)	25 to 29 volts	24 volts	30 volts
Ac loadmeter (paralleled flight operation)	Within ±8.3 amperes of average load with total load not less than 167 amperes, as specified in Note 2	Zero	114 amperes
Ac loadmeter (unparalleled, flight operation)	Over zero and under 114 amperes	Zero	114 amperes
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±8.3 amperes of average load with total load not less than 167 amperes, as specified in Note 2	Zero	83.3 amperes
Ac loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 83.3 amperes	Zero	83.3 amperes
Generator overload light (ground operation)	Light should come on between loadmeter indication of 78 and 83.3 amperes.		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 107 and 114 amperes.		
Dc loadmeter	Maximum difference between any two indicators should not exceed 30 amperes, and all indicators should indicate some load.	Zero	65 amperes

	Normal	Allowable	
	Min or Max	Min	Max
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short time operation are:

(a) 125 amperes for 5 minutes

(b) Over 125 amperes for 5 seconds (the overload rating of the generator is 166.6 amperes for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208-volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

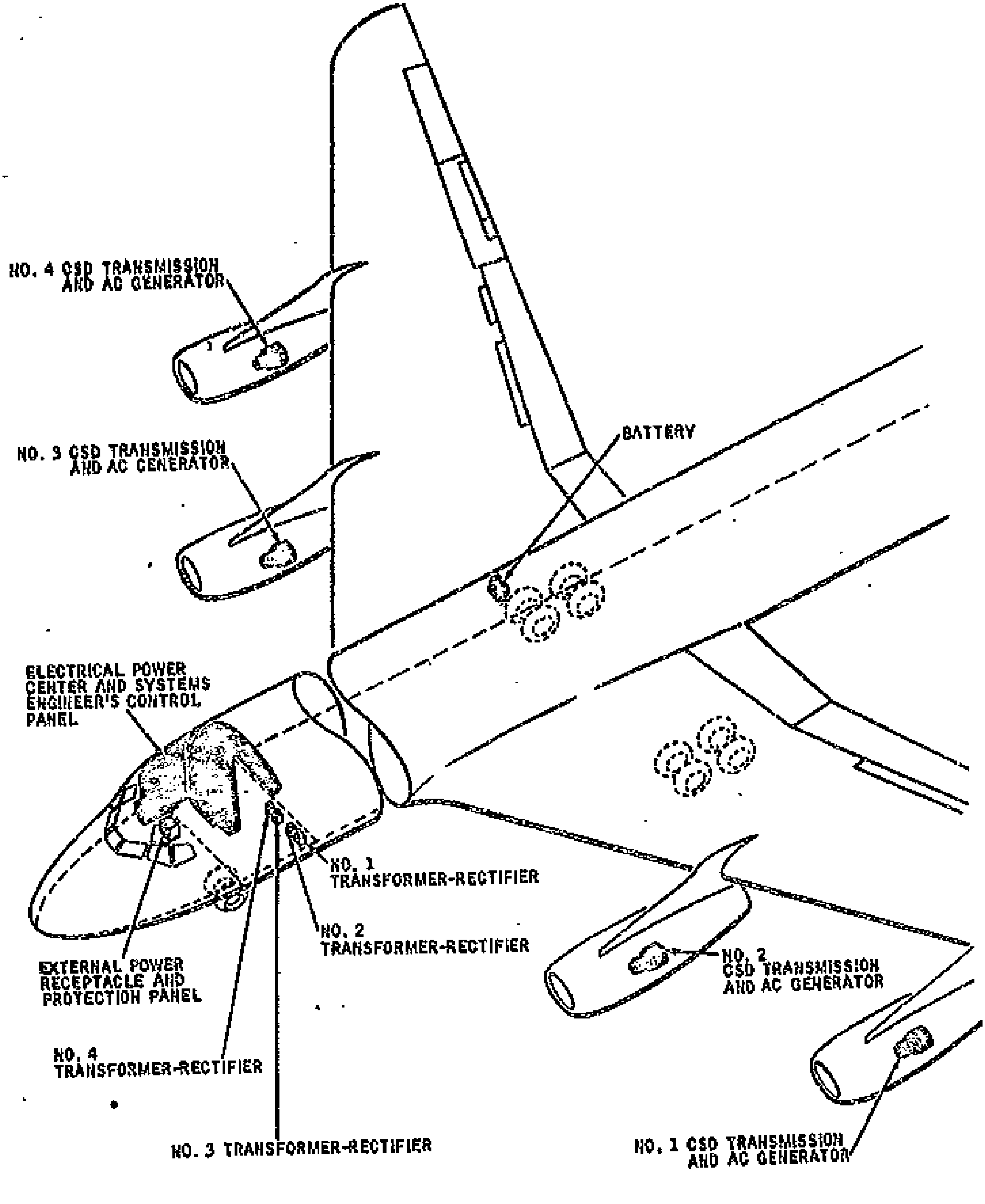
B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant speed drive (CSD) transmission. Frequency is normally maintained at 400 (±0.1) cps by a frequency and load control panel which transmits signals to the magnetic trim head of the CSD transmission speed governor, thus correcting CSD output speed to maintain 400 (±0.1) cps. If the CSD transmission is operating on the speed governor, without the fine frequency control of the frequency and load control panel, the frequency is maintained at 400 (±4) cps.

C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

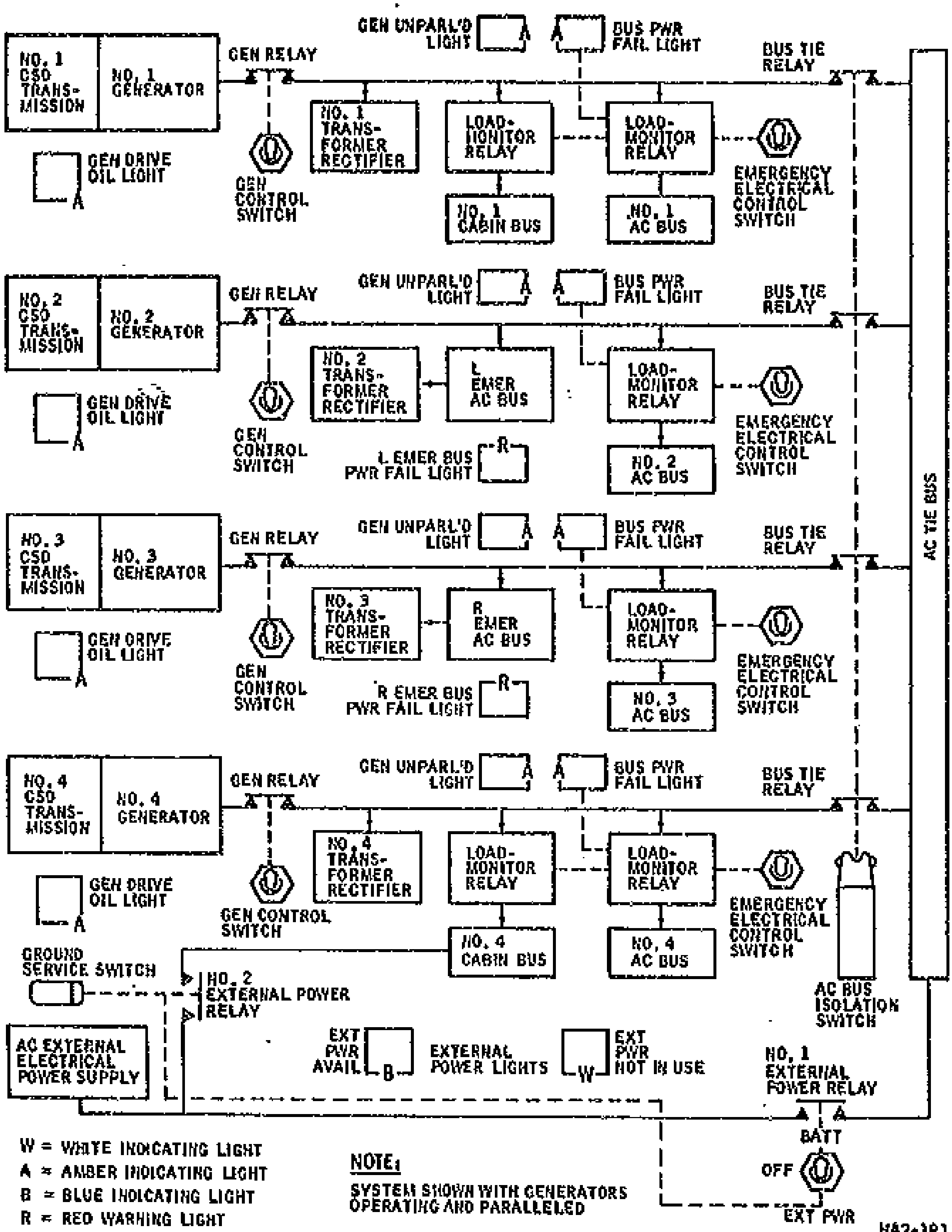
D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus, and the No. 3 generator bus is connected directly to the right ac emergency bus.

E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a



Electrical Power System Installations
Figure 1



Ac Power Distribution -- Block Diagram
Figure 2

generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

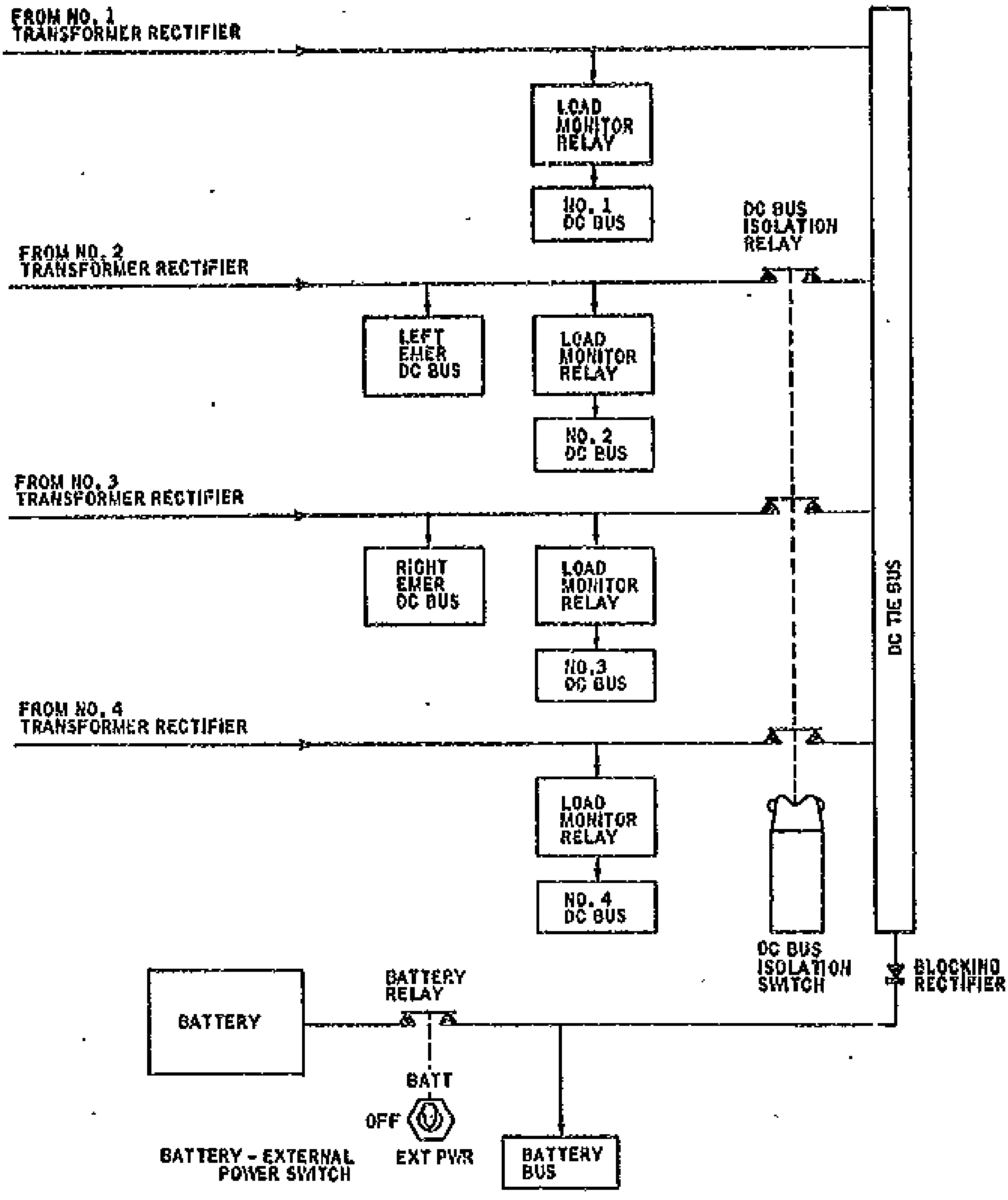
H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

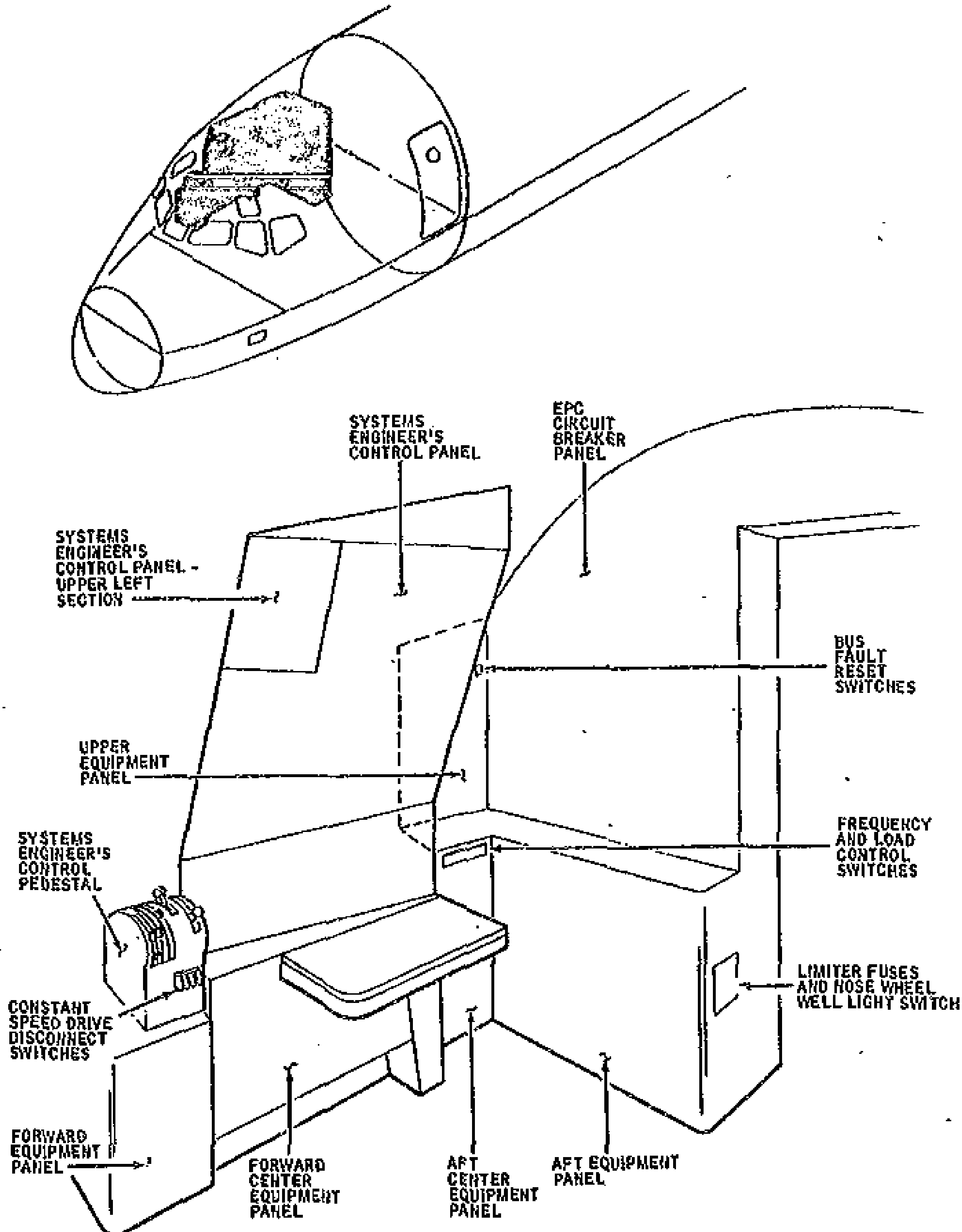
J. An external power receptacle enables the connection of a 400-cycle, 3-phase, 120/208-volt external power source to energize the airplane electrical circuits.

2. Controls and Indications (See Figure 4.)

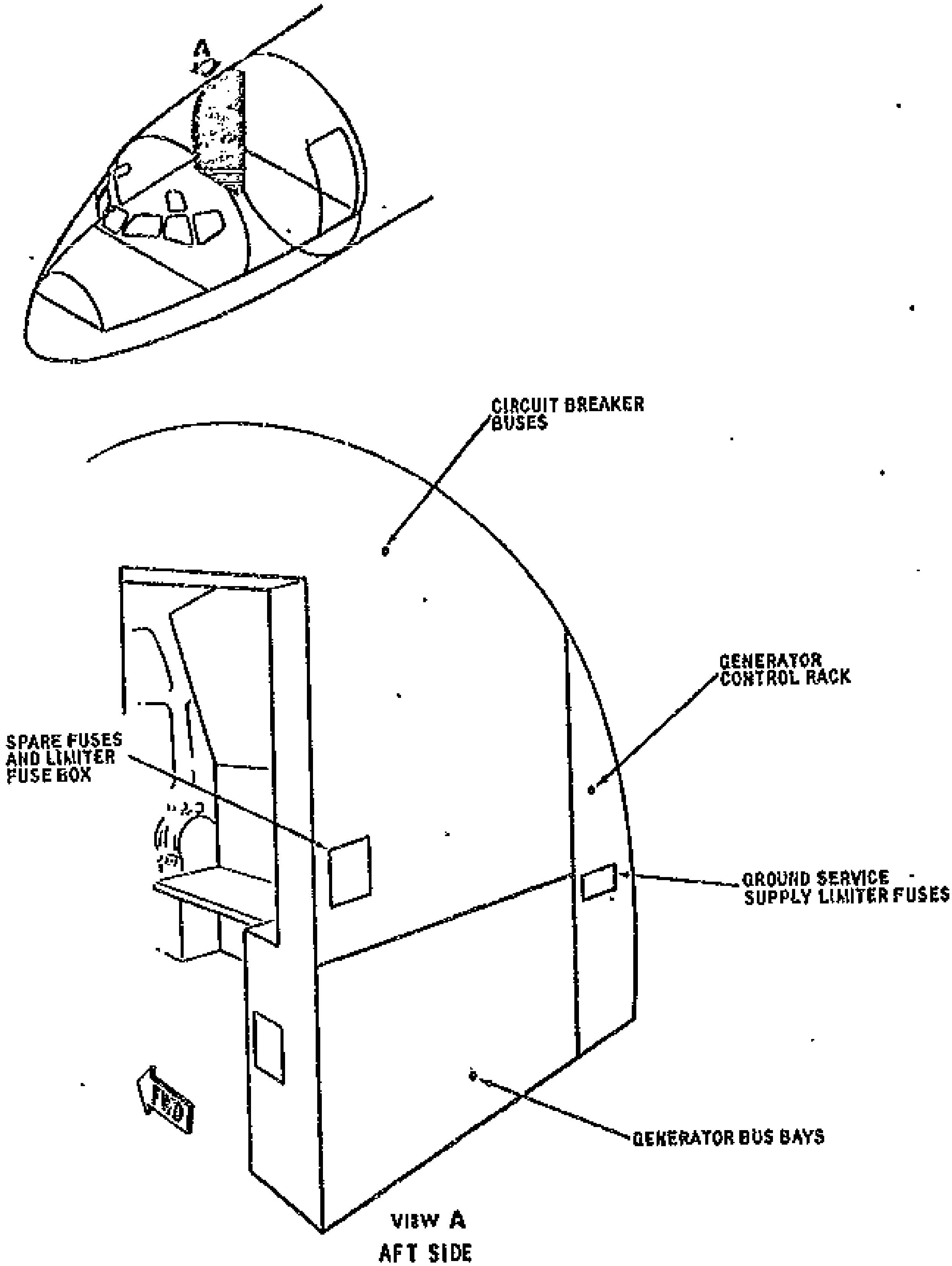
A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contain the controls and indications for the individual systems used on the airplane.



Dc Power Distribution -- Block Diagram
Figure 3



Electrical Power Center and Systems Engineer's Station
Figure 4 (Sheet 1)



HA2-1830

Electrical Power Center and Systems Engineer's Station
Figure 4 (Sheet 2)

B. Bus fault reset switches are located on the upper equipment panel. The aft center equipment panel contains the frequency and load control switches. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the systems engineer's control panel (see Figure 5).

3. Electrical Power Limitations

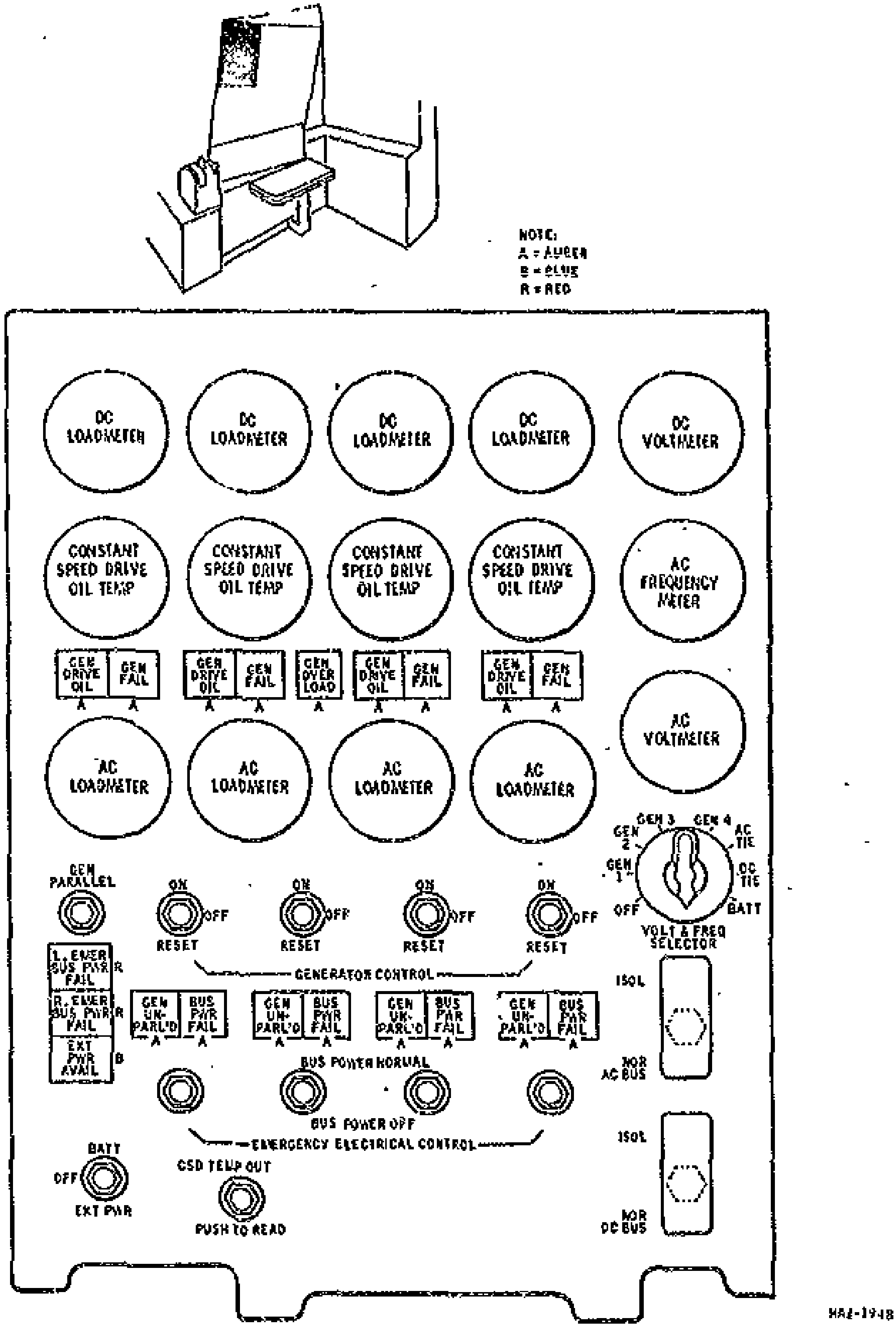
A. The values shown in the normal column are normal operating ranges. Indications outside the normal range indicate possible system abnormalities.

B. Limits shown in the allowable column should not be exceeded, and sustained operation at these limits is not recommended.

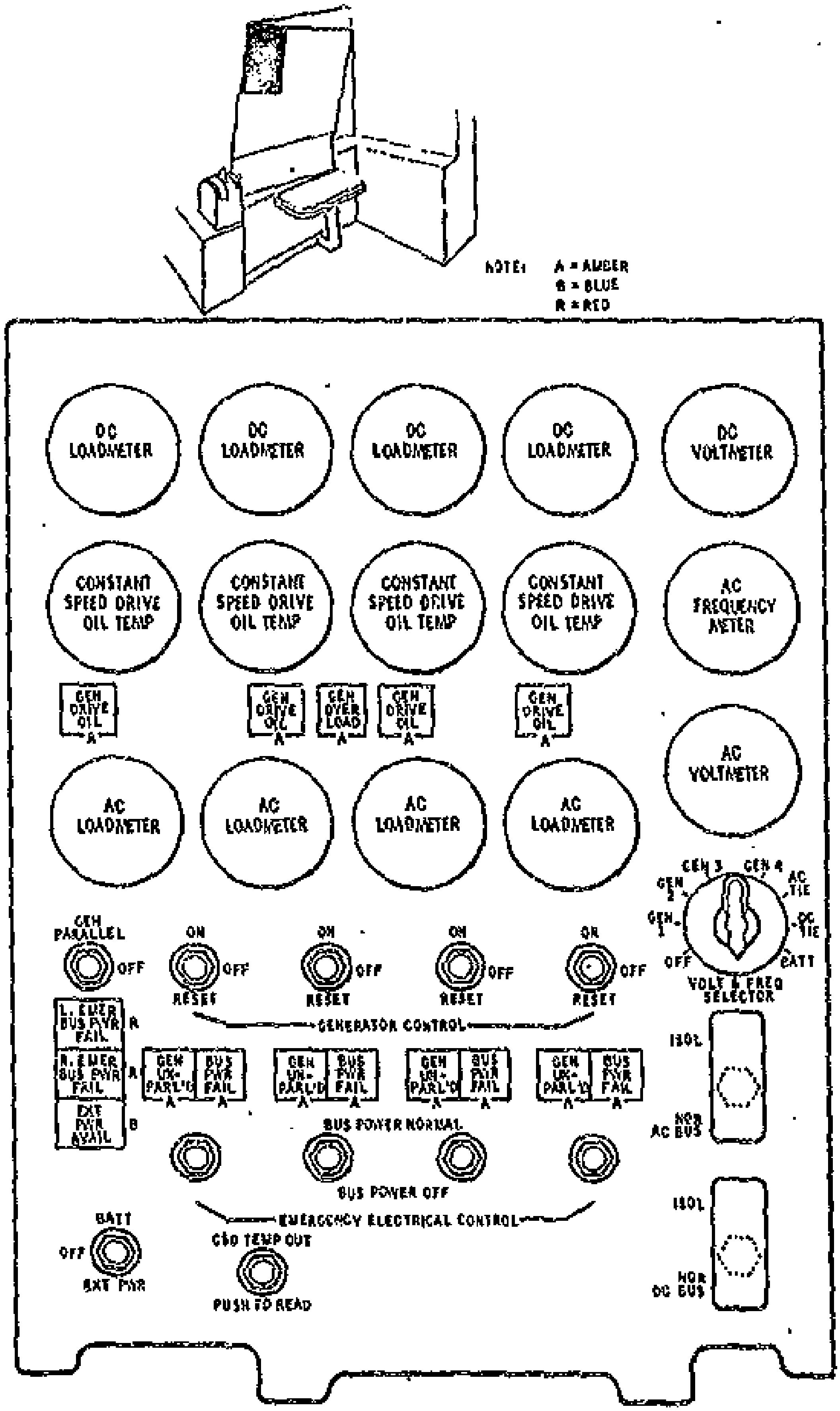
CAUTION: DAMAGE TO ELECTRICAL EQUIPMENT OF AIRPLANE IS POSSIBLE IF AC ELECTRICAL SYSTEMS HAVE BEEN SUBJECTED TO VOLTAGES HIGHER THAN 130 VOLTS, PHASE-TO-NEUTRAL, or 225 VOLTS, PHASE-TO-PHASE, DUE TO MISADJUSTMENT OF EXTERNAL POWER SUPPLY. ANY AC OVERVOLTAGE APPLIED TO TRANSFORMER-RECTIFIERS WILL RESULT IN DC OVERVOLTAGE BEING APPLIED TO DC EQUIPMENT. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

CAUTION: ANY CONDITION THAT CAUSES ANY INDICATION IN ALLOWABLE COLUMN, OTHER THAN WITHIN NORMAL RANGE, SHOULD BE CORRECTED AT EARLIEST OPPORTUNITY.

	Normal	Allowable	
	Min or Max	Min	Max
Ac voltmeter (external power or generator operation see NOTE 1)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus see NOTE 1)	396 to 404 cps	380 cps	420 cps
Frequency meter (generator operation)	398 to 402 cps	380 cps	420 cps
Dc voltmeter (battery operation	Not less than 24 volts	22 volts	



Systems Engineer's Control Panel -- Upper Left Section
(Airplanes N8070U-N8076U)
Figure 5 (Sheet 1)



Systems Engineer's Control Panel -- Upper Left Section
(Airplanes N8077U-N8099U)
Figure 5 (Sheet 2)

	Normal	Allowable	
	Min or Max	Min	Max
Dc voltmeter (external power or generator operation)	25 to 29 volts	24 volts	30 volts
Ac loadmeter (paralleled flight operation)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.0
Ac loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0.		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37		
Dc loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load	Zero	1.3

	Normal	Allowable	
	Min or Max	Min	Max
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description

A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208-volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel cadmium battery.

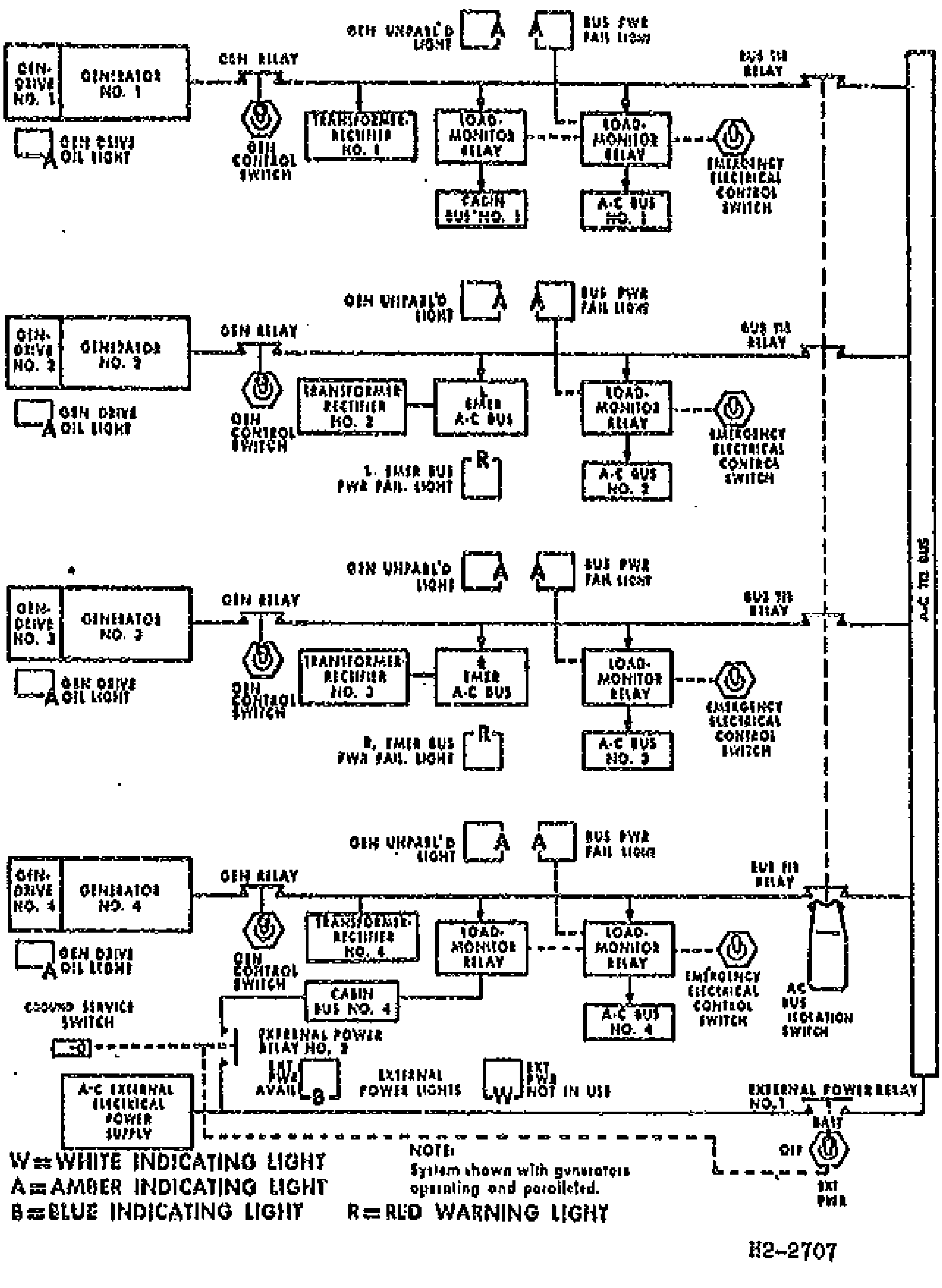
B. Generator speeds are held constant at 8000 rpm, during all variations of engine speeds between idle and takeoff, by a hydro-mechanical constant speed drive (CSD) transmission. Frequency is normally maintained at 400 (±0.1) cps by a frequency and load control panel which transmits signals to the magnetic trim head of the transmission speed governor, thus correcting transmission output speed to maintain 400 (±0.1) cps. If the transmission is operating on the speed governor, without the fine frequency control of the frequency and load control panel, the frequency is maintained at 400 (±4) cps.

C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding (CSD) transmission disconnect lever in the disengage position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished by placing the disconnect lever in the engage position.

D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 1). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus; and the No. 3 generator bus is connected directly to the right ac emergency bus.

E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.



Ac Power Distribution -- Block Diagram
Figure 1

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 2). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

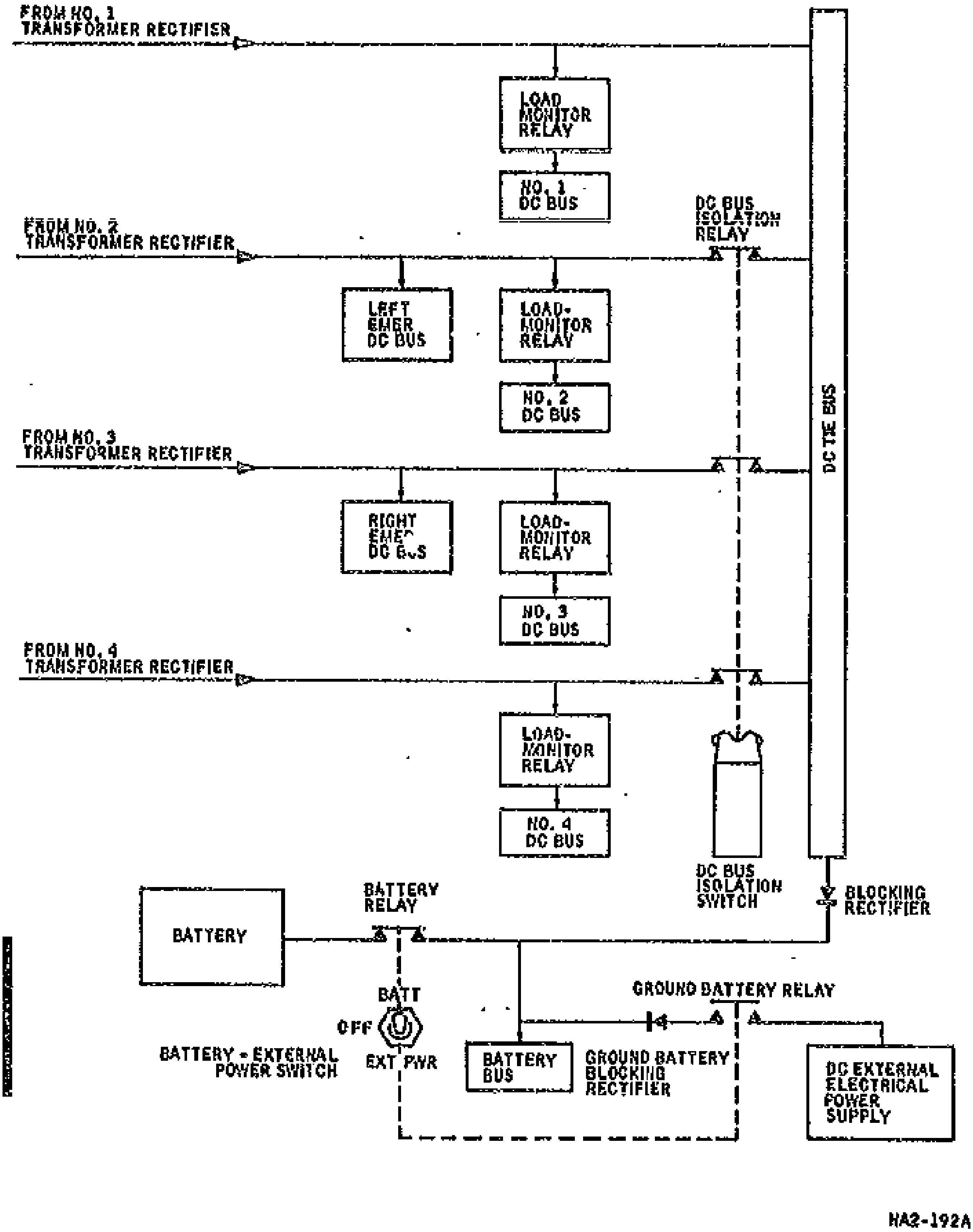
I. The 24-volt dc system can also be supplied power from a 24-volt nickel cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

J. An external power receptacle enables the connection of a 400-cycle, 3-phase, 120/208-volt external power source to energize the airplane electrical circuits.

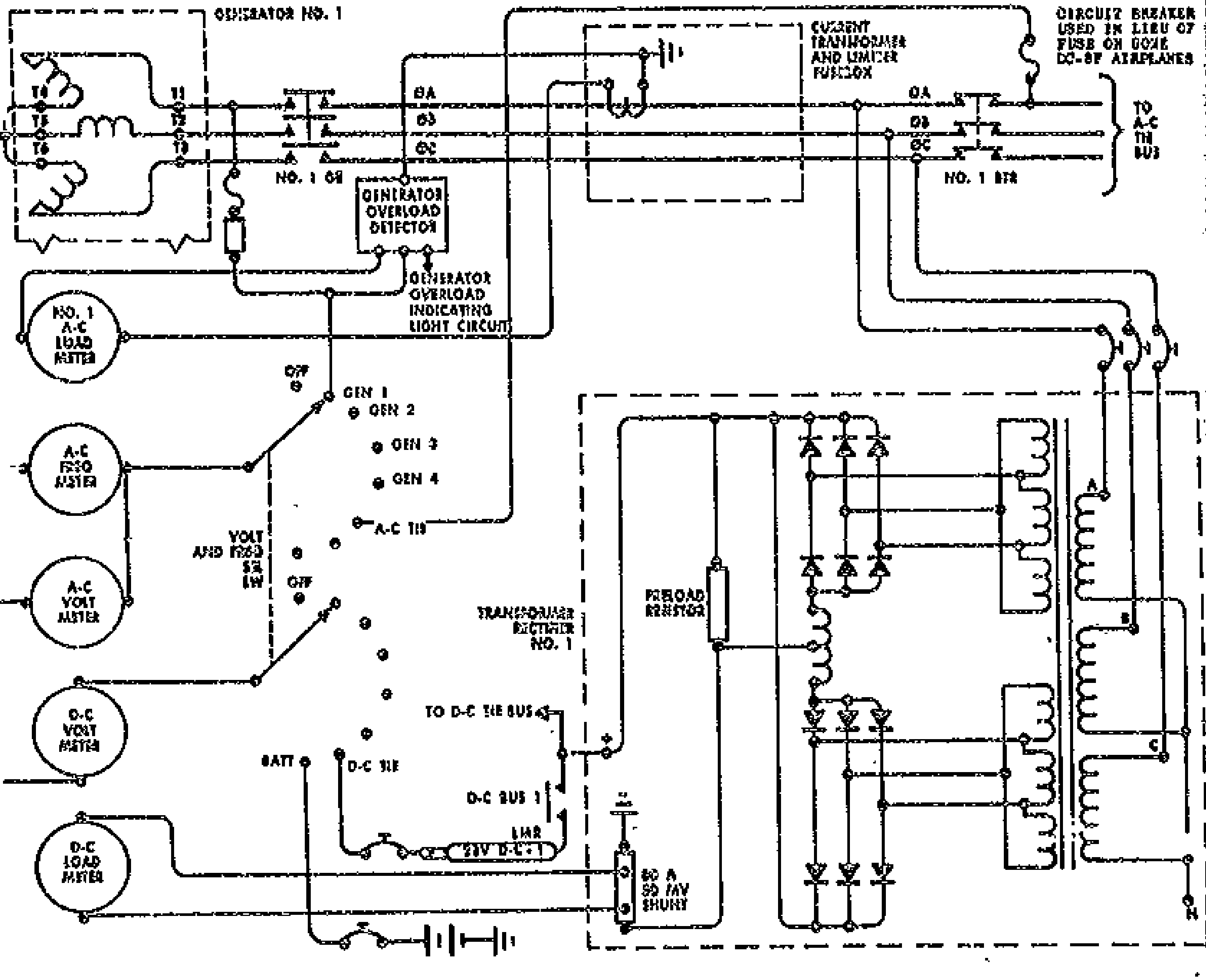
2. Controls and Indications (See Figures 2A, 2B, and 3.)

A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contains the controls and indications for the individual systems used on the airplane.

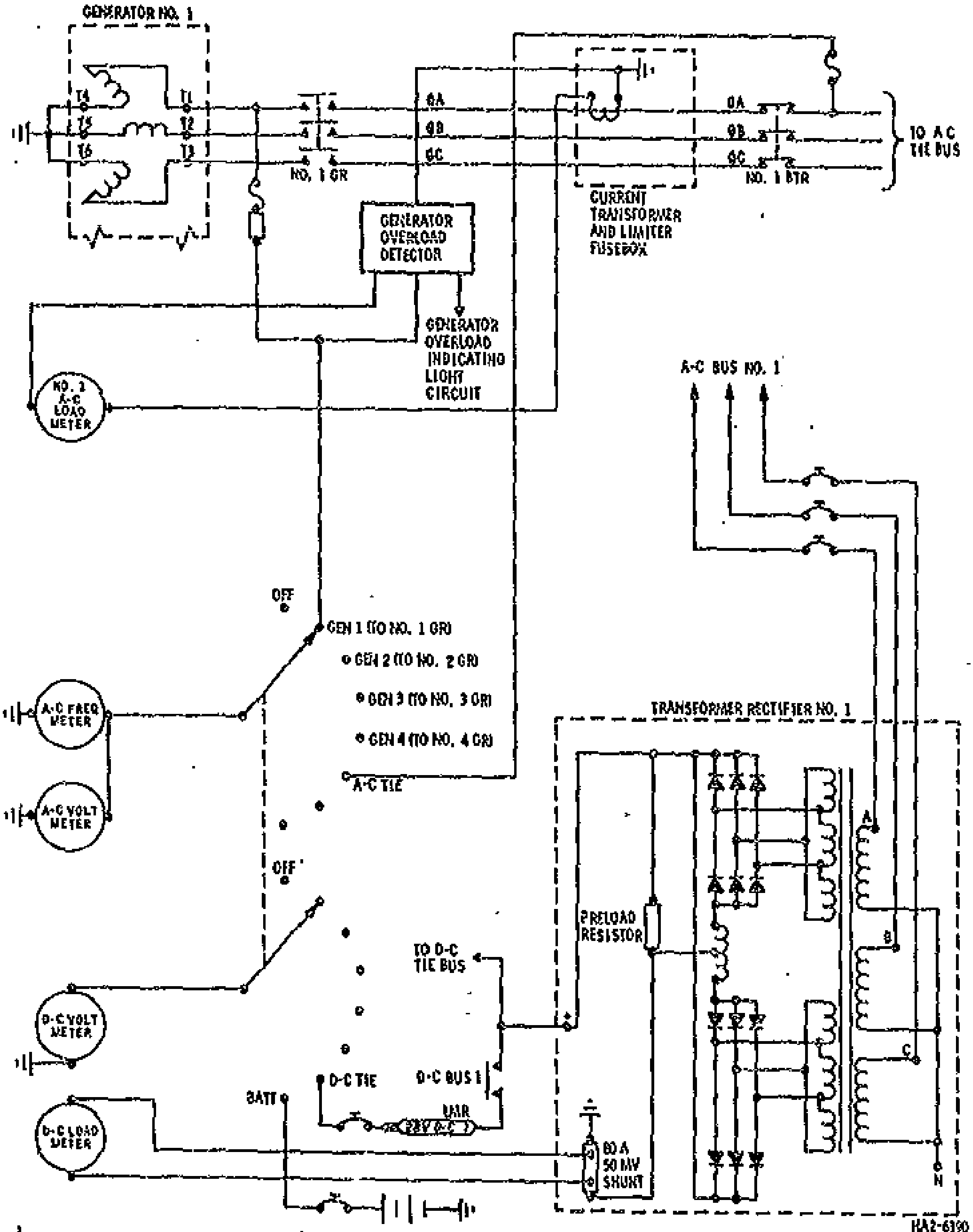
B. Bus fault reset switches are located on the upper equipment panel. The aft center equipment panel contains the frequency and load control switches. CSD transmission disconnect levers for disengaging each transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.



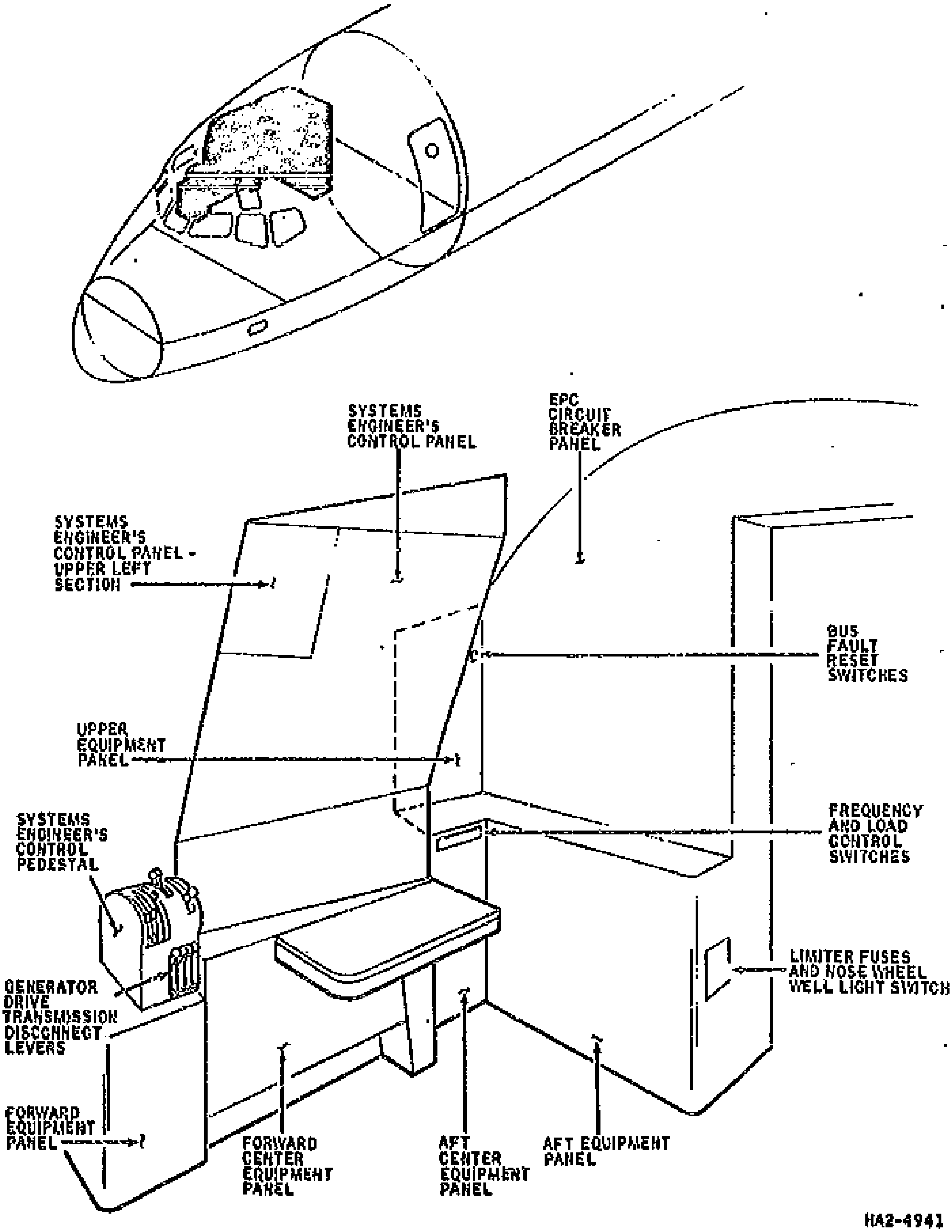
Dc Power Distribution -- Block Diagram
Figure 2



Ac and Dc Monitoring Instrumentation
Airplanes 801, 803 - 822
Figure 2A



Ac and Dc Monitoring Instrumentation
Airplane 802
Figure 2B



Electrical Power Center and
Systems Engineer's Station
Figure 3 (Sheet 1)

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the section of the systems engineer's control panel (see Figure 4).

3. Electrical Power Limitations

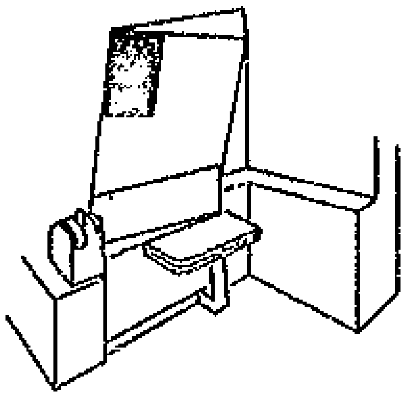
A. The values shown in the normal column are normal operating ranges. Indications outside the normal range indicate possible system abnormalities.

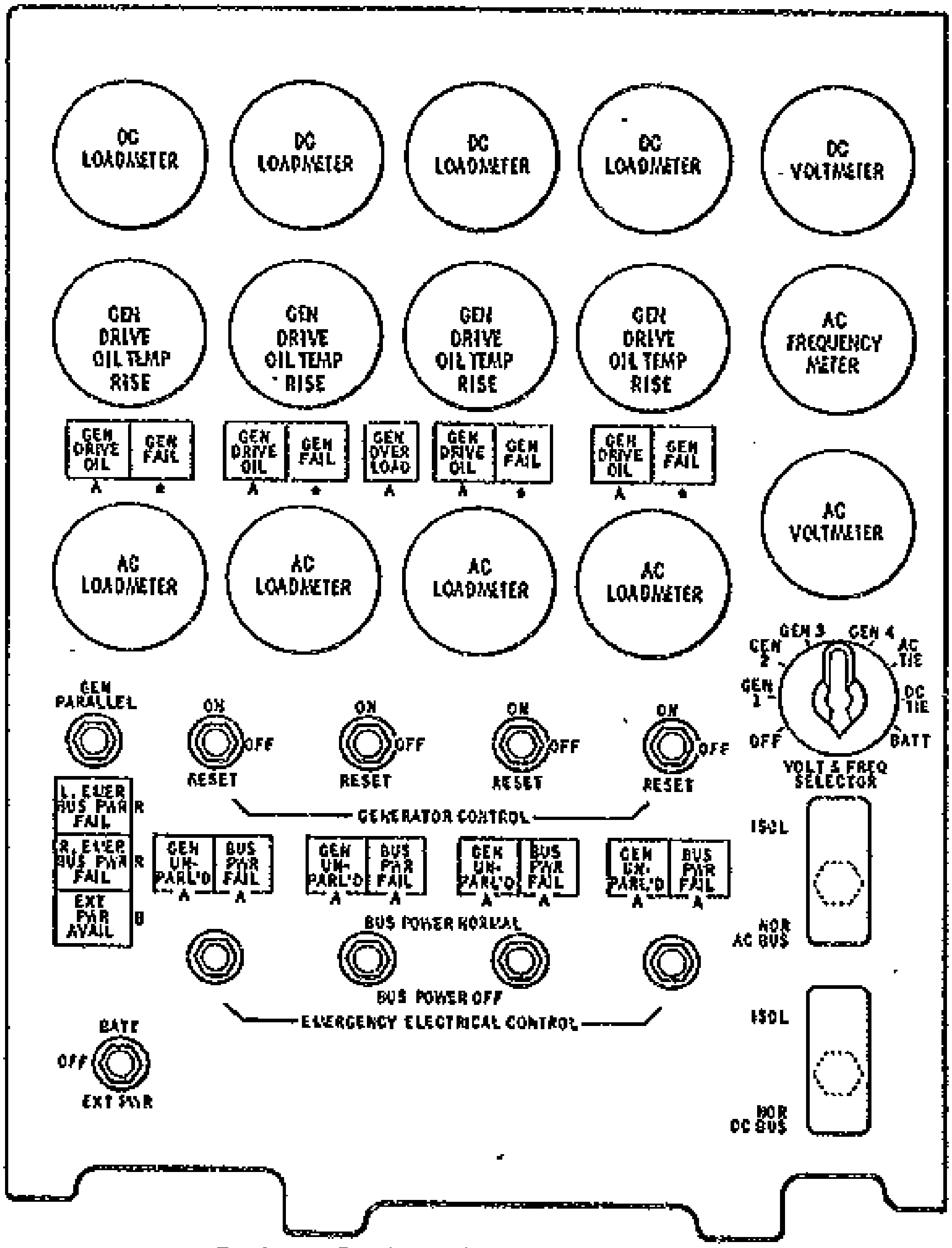
B. Limits shown in the allowable column should not be exceeded, and sustained operation at these limits is not recommended.

CAUTION: DAMAGE TO ELECTRICAL EQUIPMENT OF AIRPLANE IS POSSIBLE IF AC ELECTRICAL SYSTEMS HAVE BEEN SUBJECTED TO VOLTAGES HIGHER THAN 130 VOLTS, PHASE-TO-NEUTRAL, OR 225 VOLTS, PHASE-TO-PHASE, DUE TO ANY MISADJUSTMENT OF EXTERNAL POWER SUPPLY. ANY AC OVERVOLTAGE APPLIED TO TRANSFORMER-RECTIFIERS WILL RESULT IN DC OVERVOLTAGE BEING APPLIED TO DC EQUIPMENT. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

CAUTION: ANY CONDITION THAT CAUSES ANY INDICATION IN ALLOWABLE COLUMN, OTHER THAN WITHIN NORMAL RANGE, SHOULD BE CORRECTED AT EARLIEST OPPORTUNITY.

	Normal	Allowable	
	Min or Max	Min	Max
Ac voltmeter (external power or generator operation)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus)	396 to 404 cps	380 cps	420 cps
Frequency meter (generator operation)	398 to 402 cps		
Dc voltmeter (battery operation)	Not less than 24 volts		





Systems Engineer's Control Panel --
Upper Left Section
Figure 4

	Normal	Allowable	
	Min or Max	Min	Max
Dc voltmeter (external power or generator operation	25 to 29 volts		
Ac voltmeter (paralleled flight operation)	Within 0.1 of average load with total load not less than 2.0, as specified in Note 1	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 2)	Within 0.1 of average load with total load not less than 2.0, as specified in Note 1	Zero	1.0
Ac loadmeter (unparalleled, ground operation, see Note 2)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0.		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37.		
Dc loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load.		

	Normal	Allowable	
	Min or Max	Min	Max
Generator drive transmission oil temperature rise	5° to 10° (1/4 to 1/2 of normal range)		

NOTE 1: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 2: Generator overload ratings for short time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

   A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208 volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

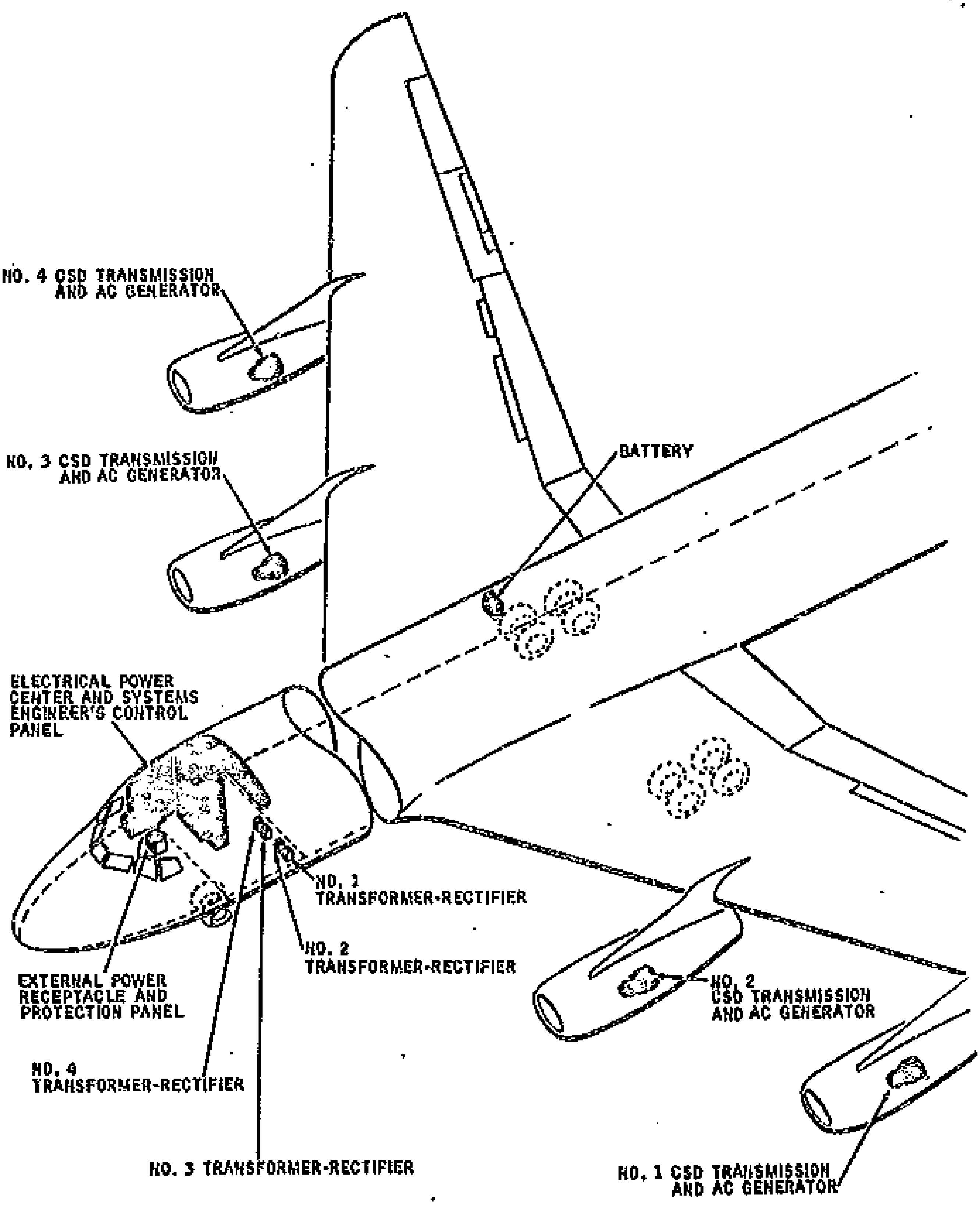
   B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant speed drive (CSD) transmission. Frequency is maintained at 400 (±4) cps by the CSD transmission speed governor.

   C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop.. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

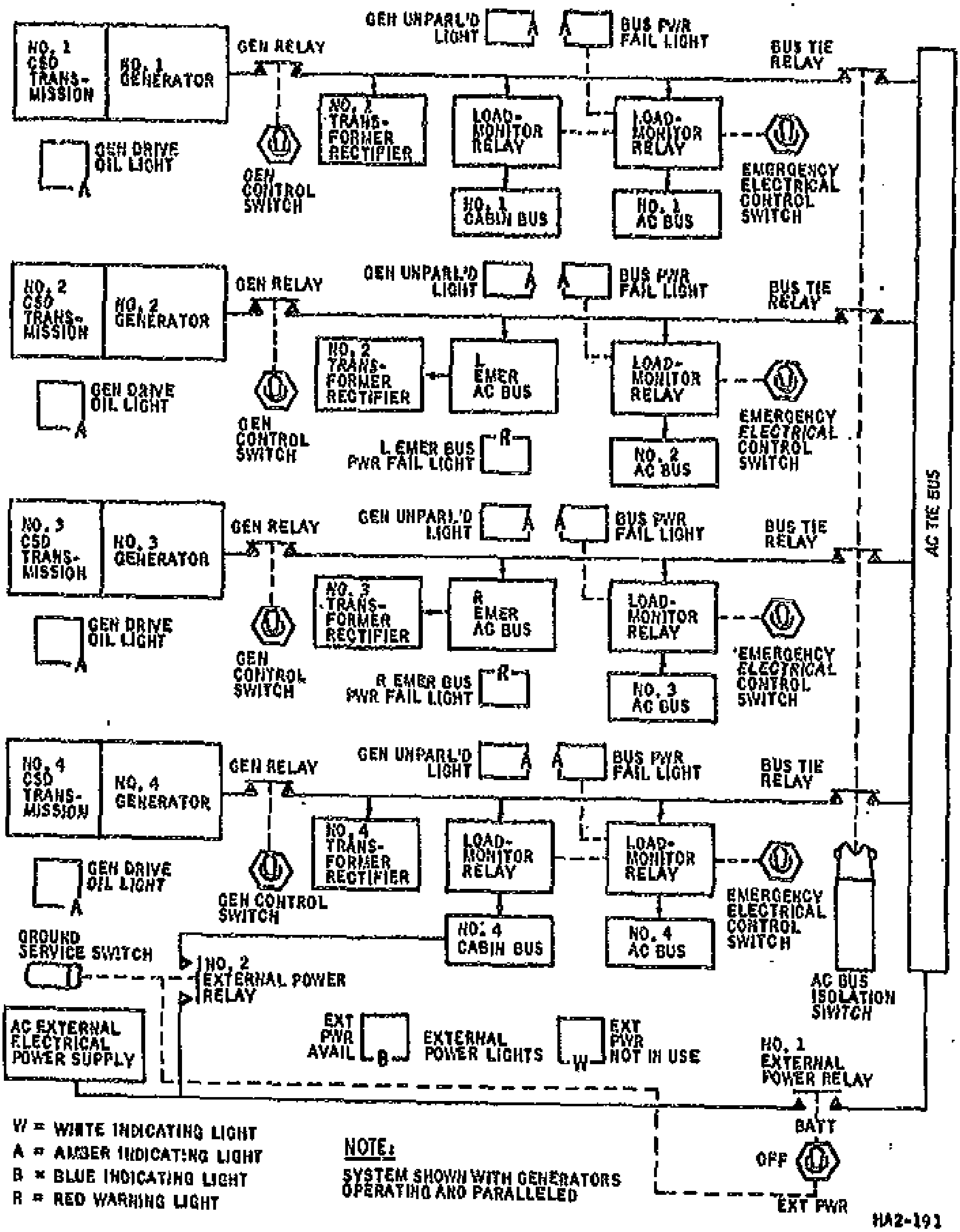
   D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus, and the No. 3 generator bus is connected directly to the right ac emergency bus.

   E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

   F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.



Electrical Power System Installations
Figure 1



Ac Power Distribution -- Block Diagram
Figure 2

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G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

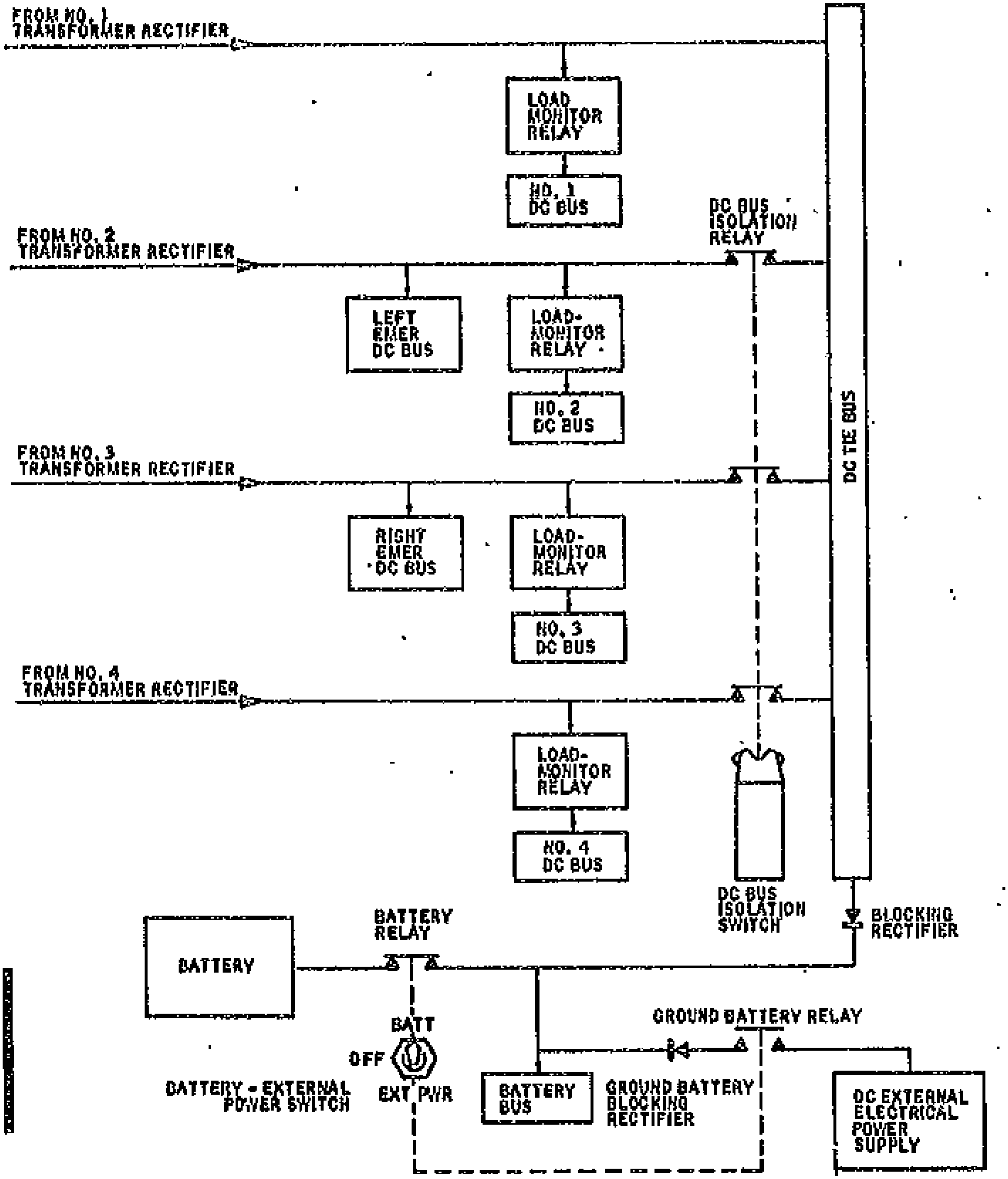
H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

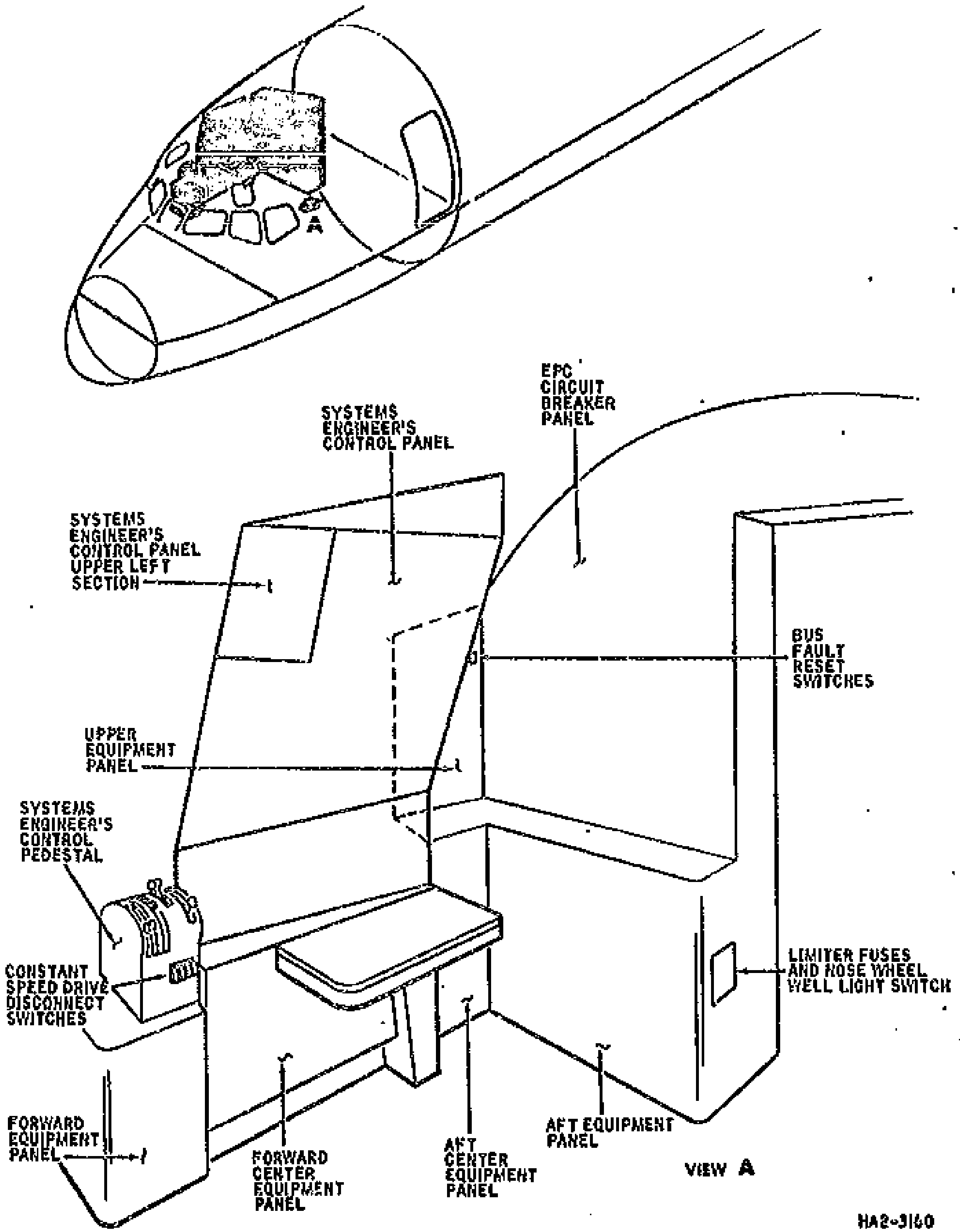
J. An external power receptacle enables the connection of a 400-cycle, 3-phase, 120/208-volt external power source to energize the airplane electrical circuits.

2. Controls and Indications (See Figure 4.)

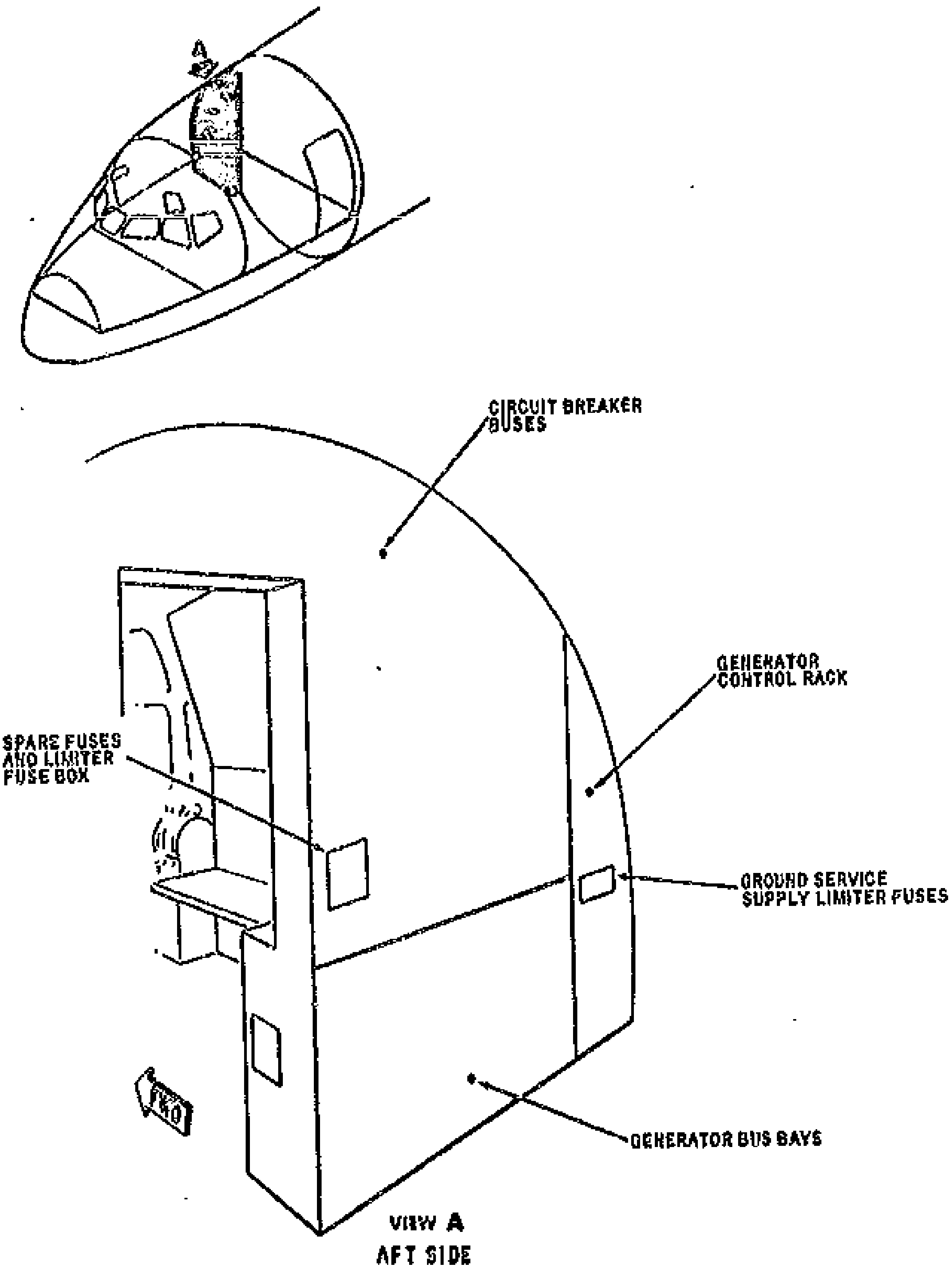
A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contains the controls and indications for the individual systems used on the airplane.



Dc Power Distribution -- Block Diagram



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 1)



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 2)

B. Bus fault reset switches are located on the upper equipment panel. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the systems engineer's control panel (see Figure 5).

3. Electrical Power Limitations

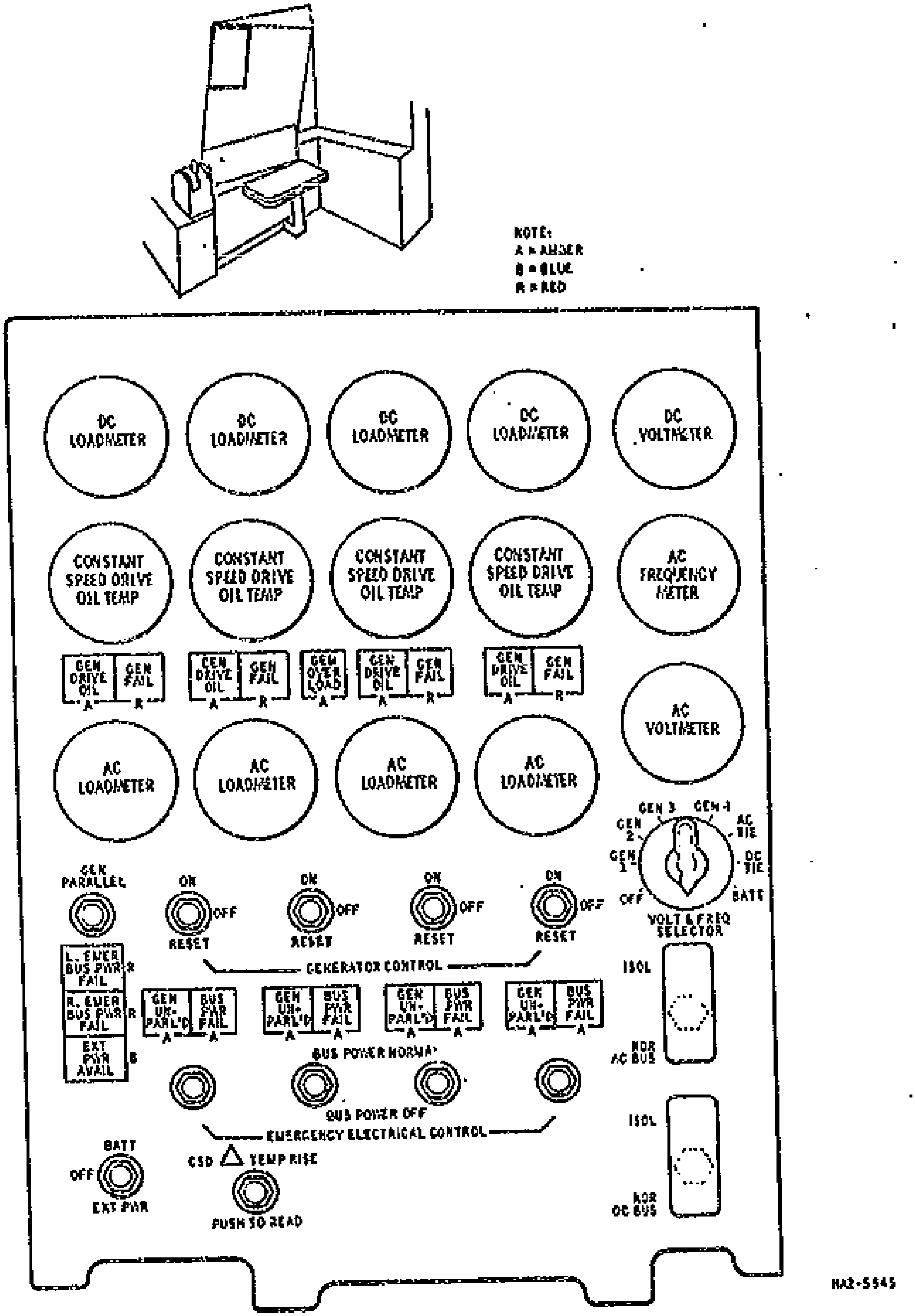
A. The values shown in the normal column are normal operating ranges. Indications outside the normal range indicate possible system abnormalities.

B. Limits shown in the allowable column should not be exceeded, and sustained operation at these limits is not recommended.

CAUTION: DAMAGE TO ELECTRICAL EQUIPMENT OF AIRPLANE IS POSSIBLE IF AC ELECTRICAL SYSTEMS HAVE BEEN SUBJECTED TO VOLTAGES HIGHER THAN 130 VOLTS, PHASE-TO-NEUTRAL, OR 225 VOLTS, PHASE-TO-PHASE, DUE TO MISADJUSTMENT OF EXTERNAL POWER SUPPLY. ANY AC OVERVOLTAGE APPLIED TO TRANSFORMER-RECTIFIERS WILL RESULT IN DC OVERVOLTAGE BEING APPLIED TO DC EQUIPMENT. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

CAUTION: ANY CONDITION THAT CAUSES ANY INDICATION IN ALLOWABLE COLUMN, OTHER THAN WITHIN NORMAL RANGE, SHOULD BE CORRECTED AT EARLIEST OPPORTUNITY.

	Normal	Allowable	
	Min or Max	Min	Max
Ac voltmeter (external power or generator operation see NOTE 1)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus see NOTE 1)	396 to 404 cps	380 cps	420 cps
Frequency meter (generator operation)	396 to 404 cps	380 cps	420 cps



Systems Engineer's Control Panel --
Upper Left Section
Figure 5

	Normal	Allowable	
	Min or Max	Min	Max
Dc voltmeter (battery operation)	Not less than 24 volts	22 volts	
Dc voltmeter (external power or generator operation)	25 to 29 volts	24 volts	30 volts
Ac loadmeter (paralleled, flight operation)	With ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.0
Ac loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0.		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37.		
Dc loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load.	Zero	1.3

	Normal	Allowable	
	Min or Max	Min	Max
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

   A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208 volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

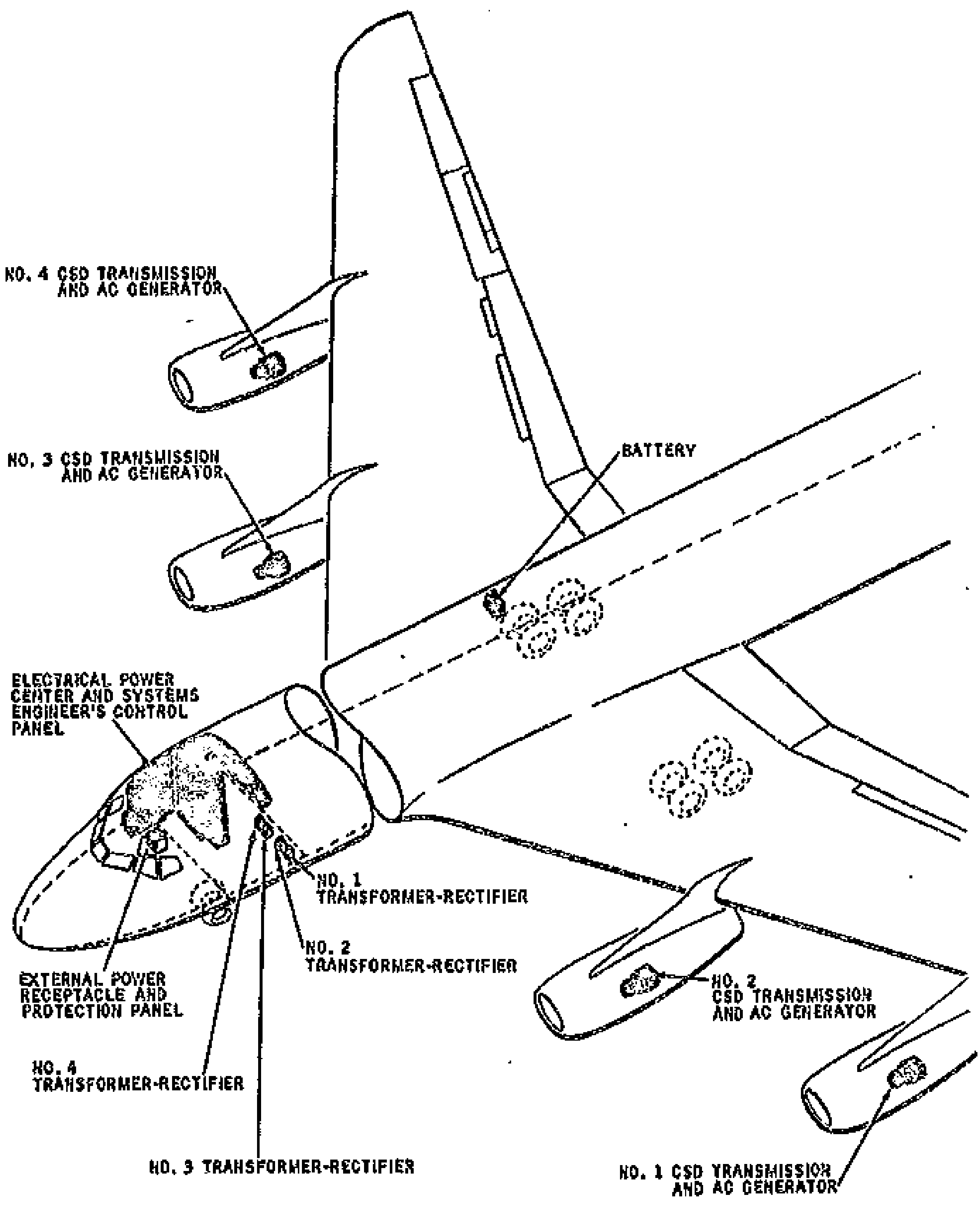
   B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant speed drive (CSD) transmission. Frequency is maintained at 400 (±4) cps by the CSD transmission speed governor.

   C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

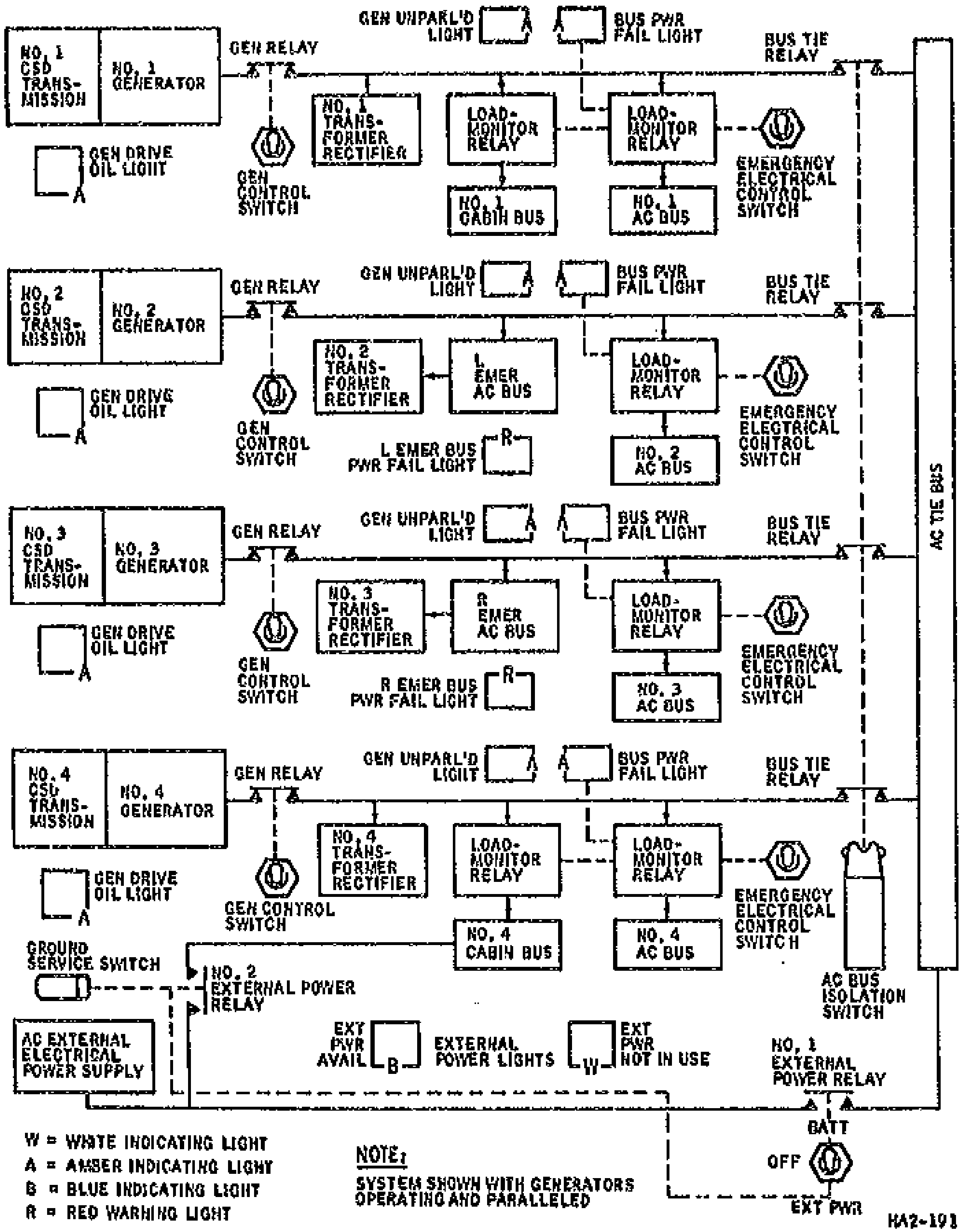
   D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus, and the No. 3 generator bus is connected directly to the right ac emergency bus.

   E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

   F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.



Electrical Power System Installations
Figure 1



Ac Power Distribution -- Block Diagram

Figure 2

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency busses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

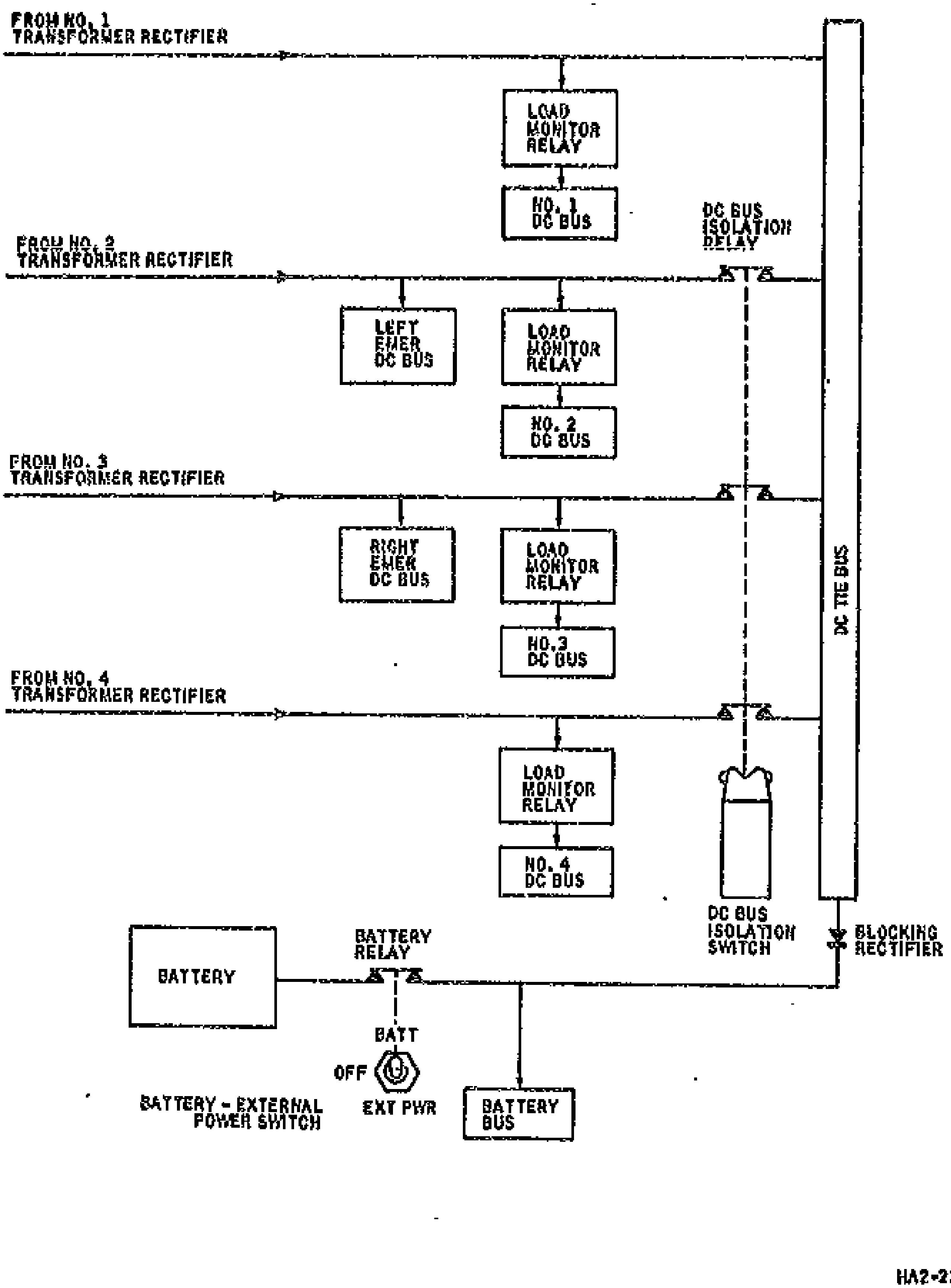
I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

J. An external power receptacle enables the connection of a 400-cycle, 3-phase, 120/208-volt external power source to energize the airplane electrical circuits.

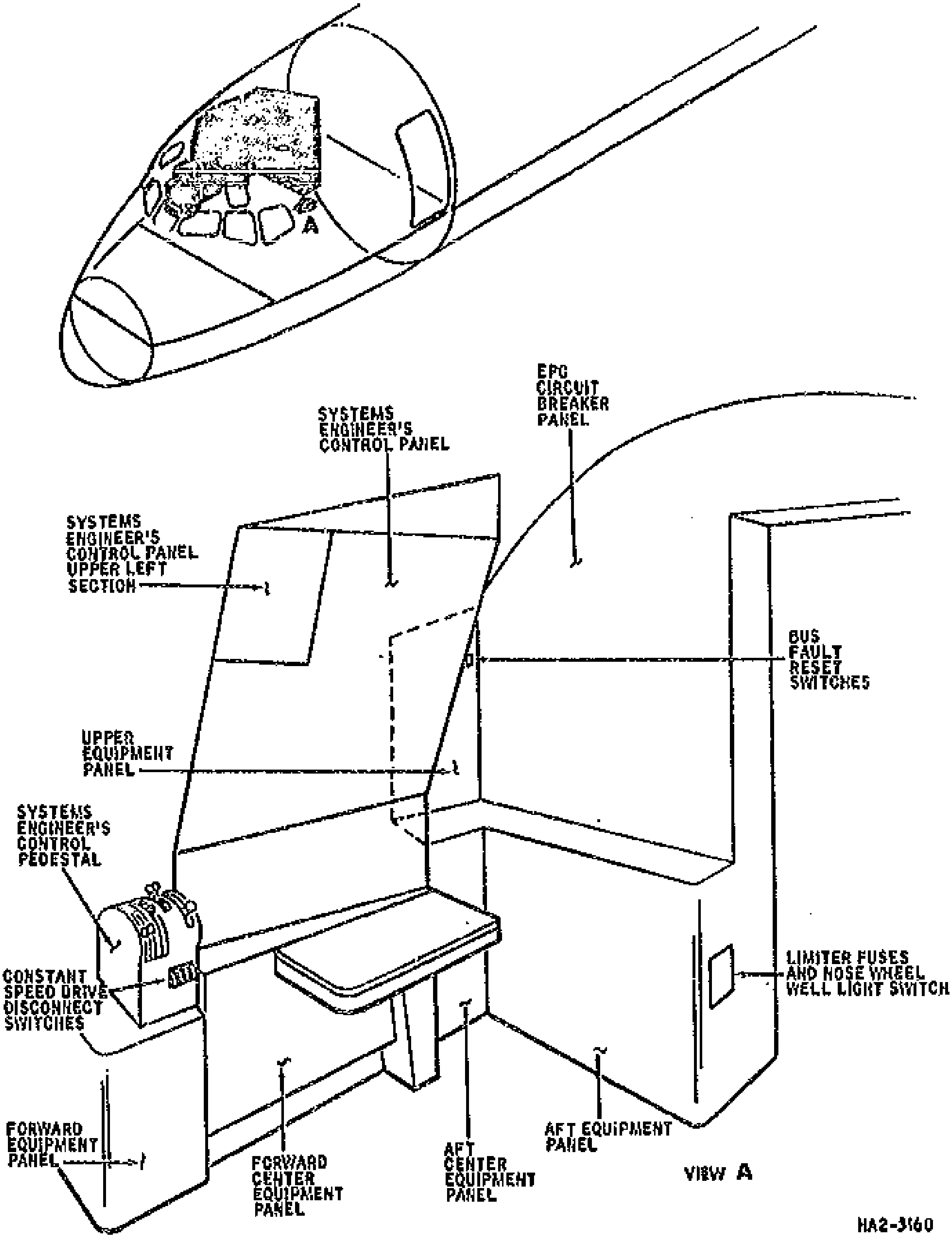
2. Controls and Indications (See Figure 4.)

A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contains the controls and indications for the individual systems used on the airplane.

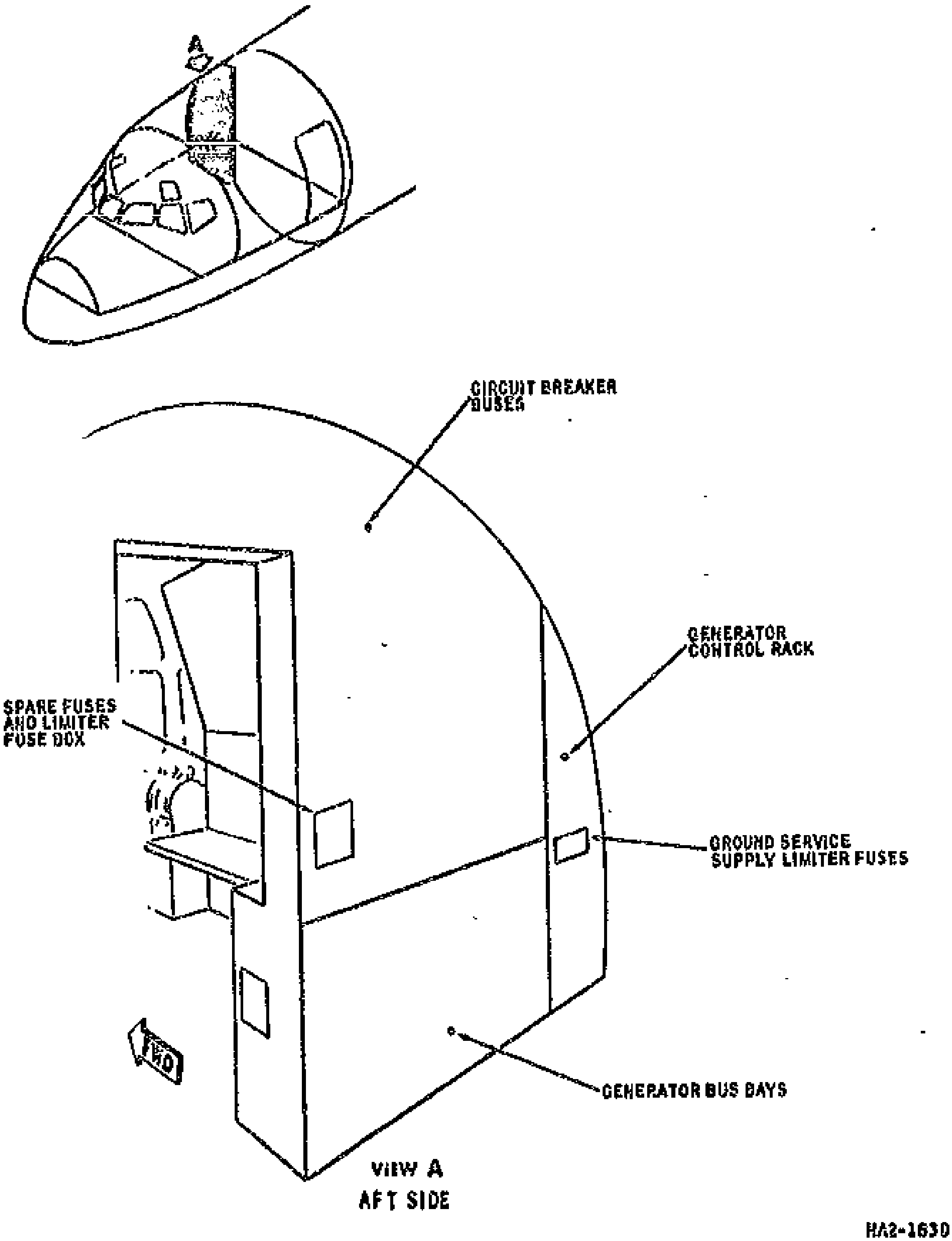
B. Bus fault reset switches are located on the upper equipment panel. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker busses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.



Dc Power Distribution -- Block Diagram
Figure 3



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 1)



Electrical Power Center and
Systems Engineer's Station
Figure 4 (Sheet 2)

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the systems engineer's control panel (see Figure 5).

3. Electrical Power Limitations

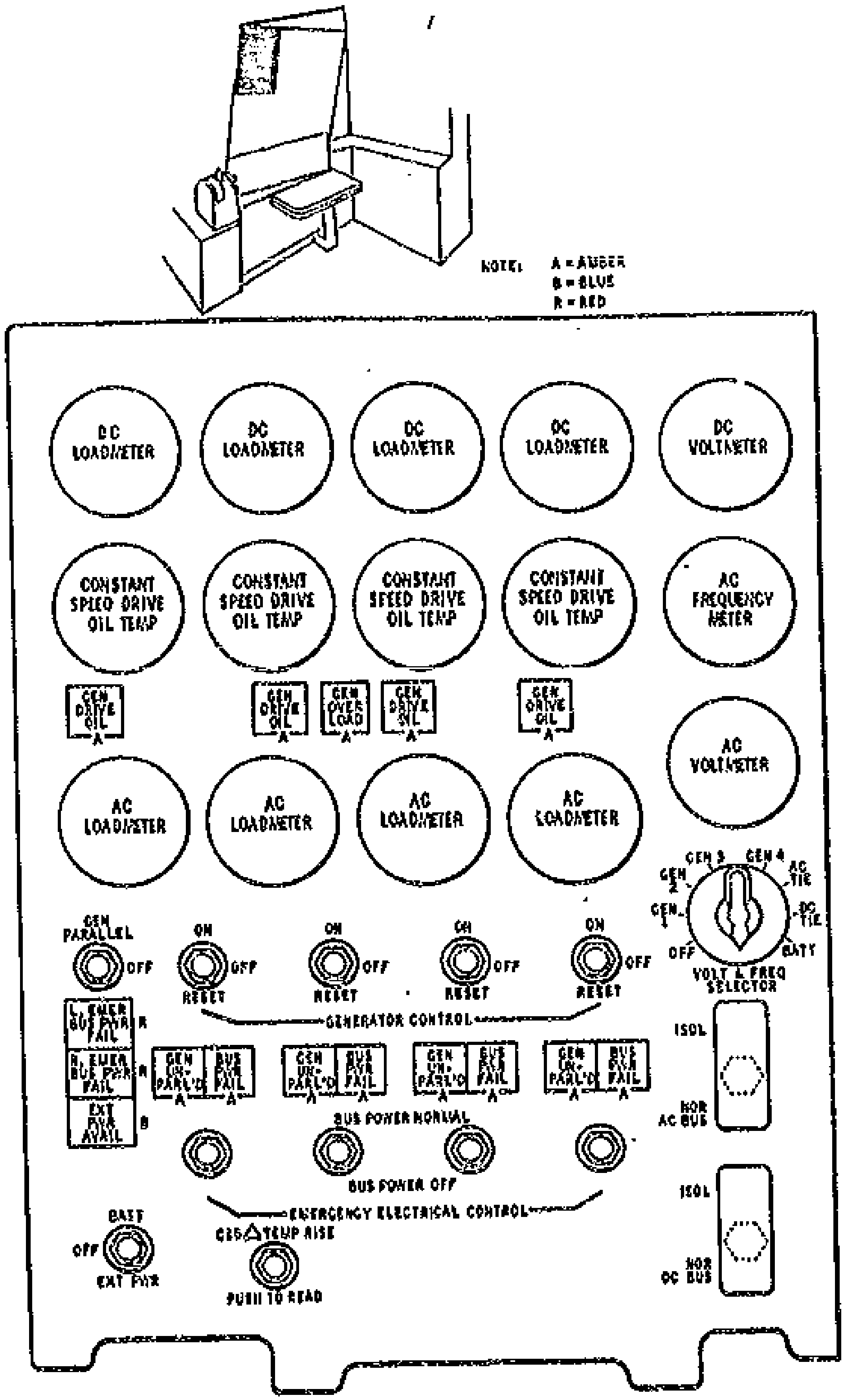
A. The values shown in the normal column are normal operating ranges. Indications outside the normal range indicate possible system abnormalities.

B. Limits shown in the allowable column should not be exceeded, and sustained operation at these limits is not recommended.

CAUTION: DAMAGE TO ELECTRICAL EQUIPMENT OF AIRPLANE IS POSSIBLE IF AC ELECTRICAL SYSTEMS HAVE BEEN SUBJECTED TO VOLTAGES HIGHER THAN 130 VOLTS, PHASE-TO-NEUTRAL, OR 225 VOLTS, PHASE-TO-PHASE, DUE TO MISADJUSTMENT OF EXTERNAL POWER SUPPLY. ANY AC OVERVOLTAGE APPLIED TO TRANSFORMER-RECTIFIERS WILL RESULT IN DC OVERVOLTAGE BEING APPLIED TO DC EQUIPMENT. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

CAUTION: ANY CONDITION THAT CAUSES ANY INDICATION IN ALLOWABLE COLUMN, OTHER THAN WITHIN NORMAL RANGE, SHOULD BE CORRECTED AT EARLIEST OPPORTUNITY.

	Normal	Allowable	
	Min or Max	Main	Max
Ac voltmeter (external power or generator operation see NOTE 1)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus see NOTE 1)	396 to 404 cps	380 cps	420 cps
Frequency meter (generator operation)	396 to 404 cps	380 cps	420 cps



Systems Engineer's Control Panel -- Upper Left Section

	Normal Min or Max	Allowable Min	 Max
Dc voltmeter (battery operation)	Not less than 24 volts	22 volts	
Dc voltmeter (external power or generator operation)	25 to 29 volts	24 volts	30 volts
Ac loadmeter (paralleled flight operation)	With ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.0
Ac loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0.		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37.		
Dc Loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load.	Zero	1.3

	Normal Min or Max	Allowable Min	Allowable Max
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

   A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208-volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

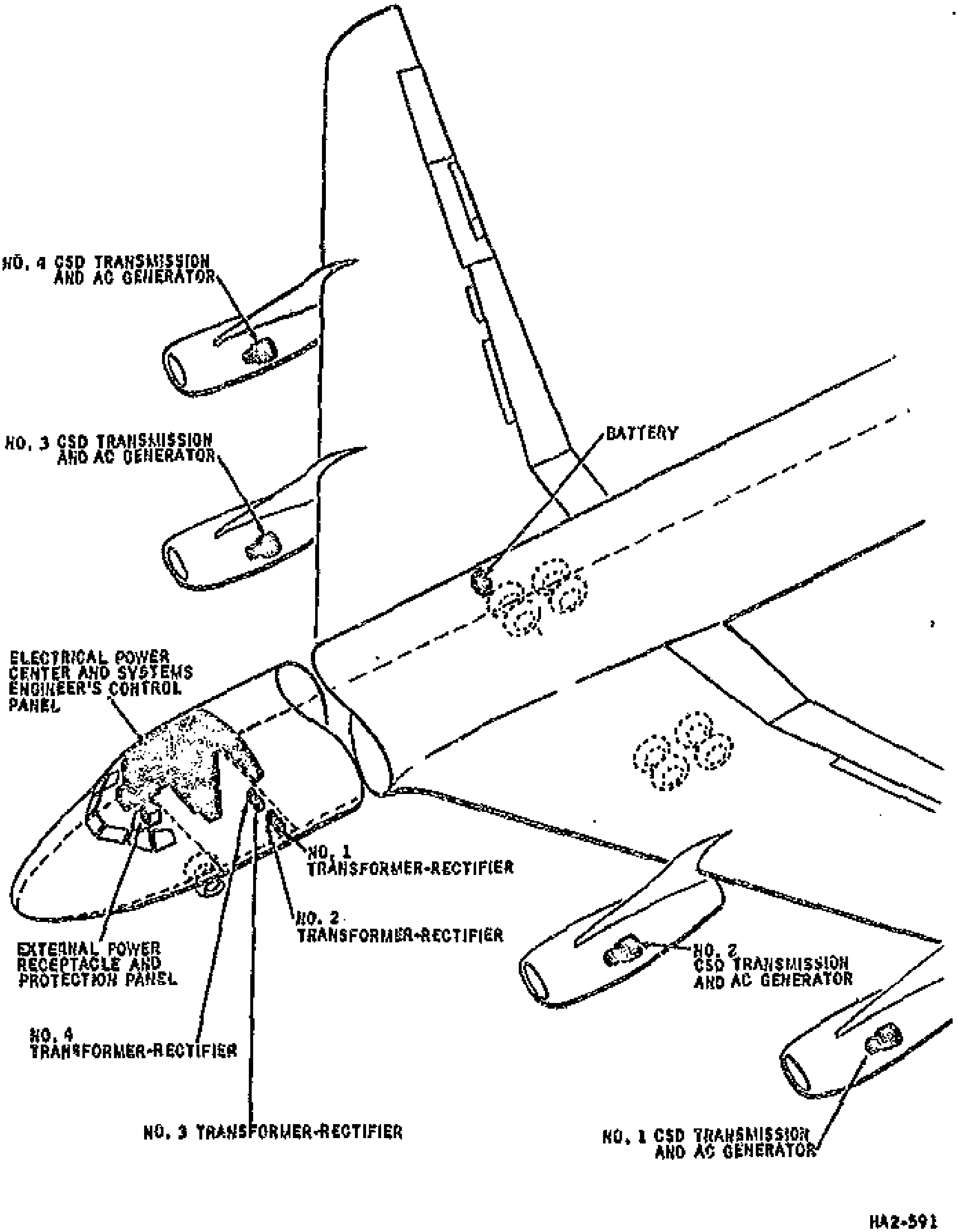
   B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant speed drive (CSD) transmission. Frequency is normally maintained at 400 (±0.1) cps by a frequency and load control panel which transmits signals to the magnetic trim head of the CSD transmission speed governor, thus correcting CSD output speed to maintain 400 (±0.1) cps. If the CSD transmission is operating on the speed governor, without the fine frequency control of the frequency and load control panel, the frequency is maintained at 400 (±4) cps.

   C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

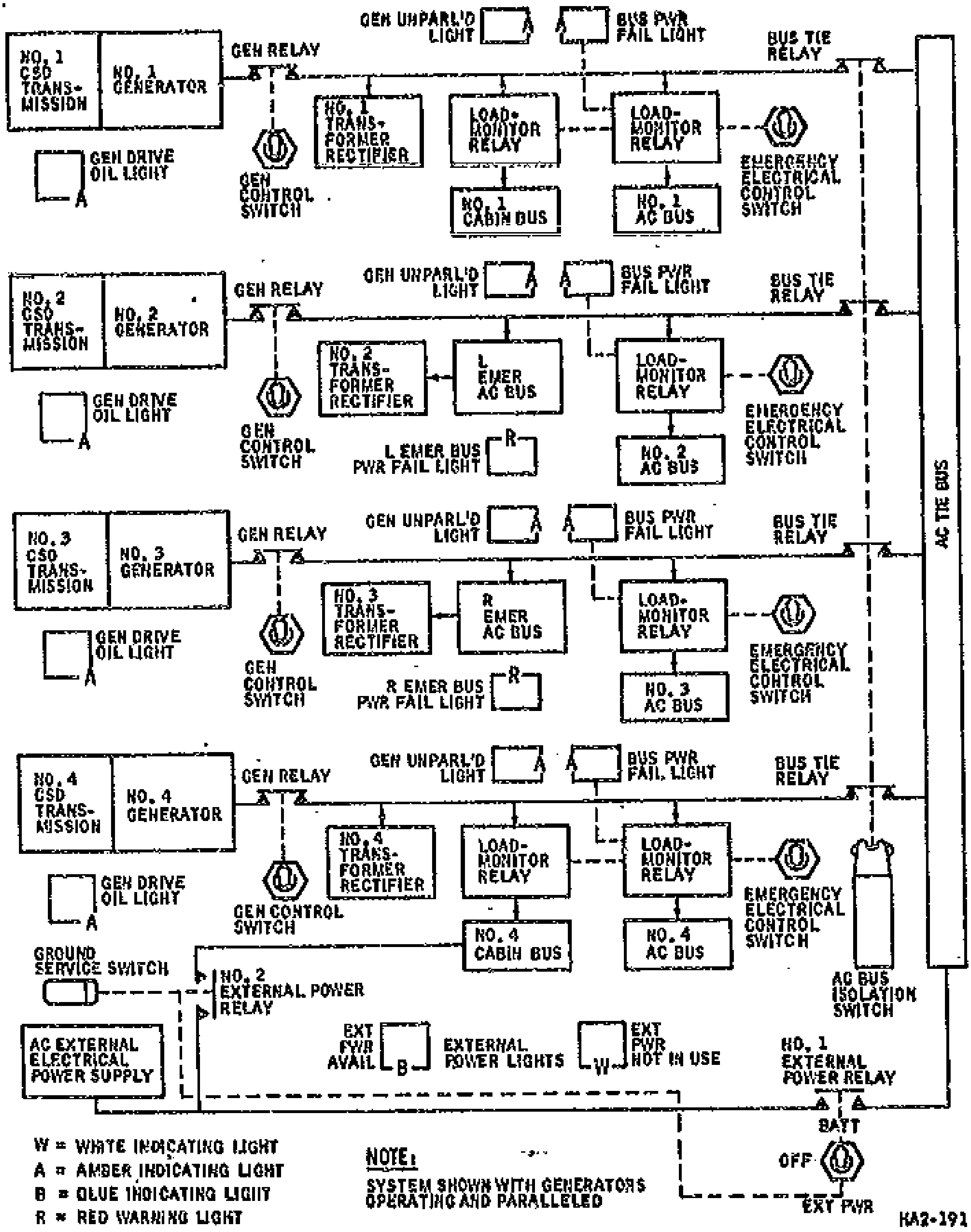
   D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus, and the No. 3 generator bus is connected directly to the right ac emergency bus.

   E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

   F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a



Electrical Power System Installation
Figure 1



Ac Power Distribution -- Block Diagram
Figure 2

generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is also supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

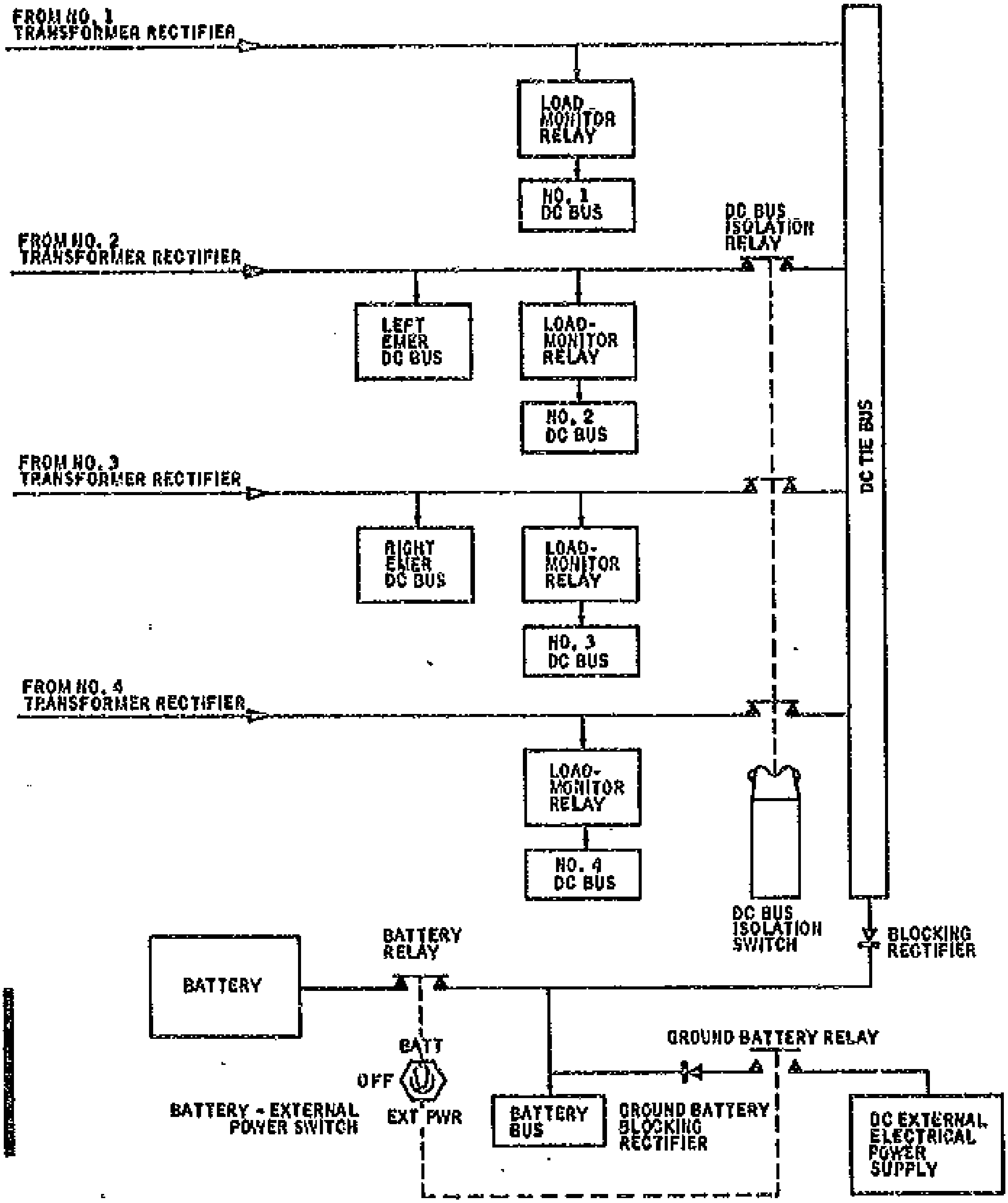
H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

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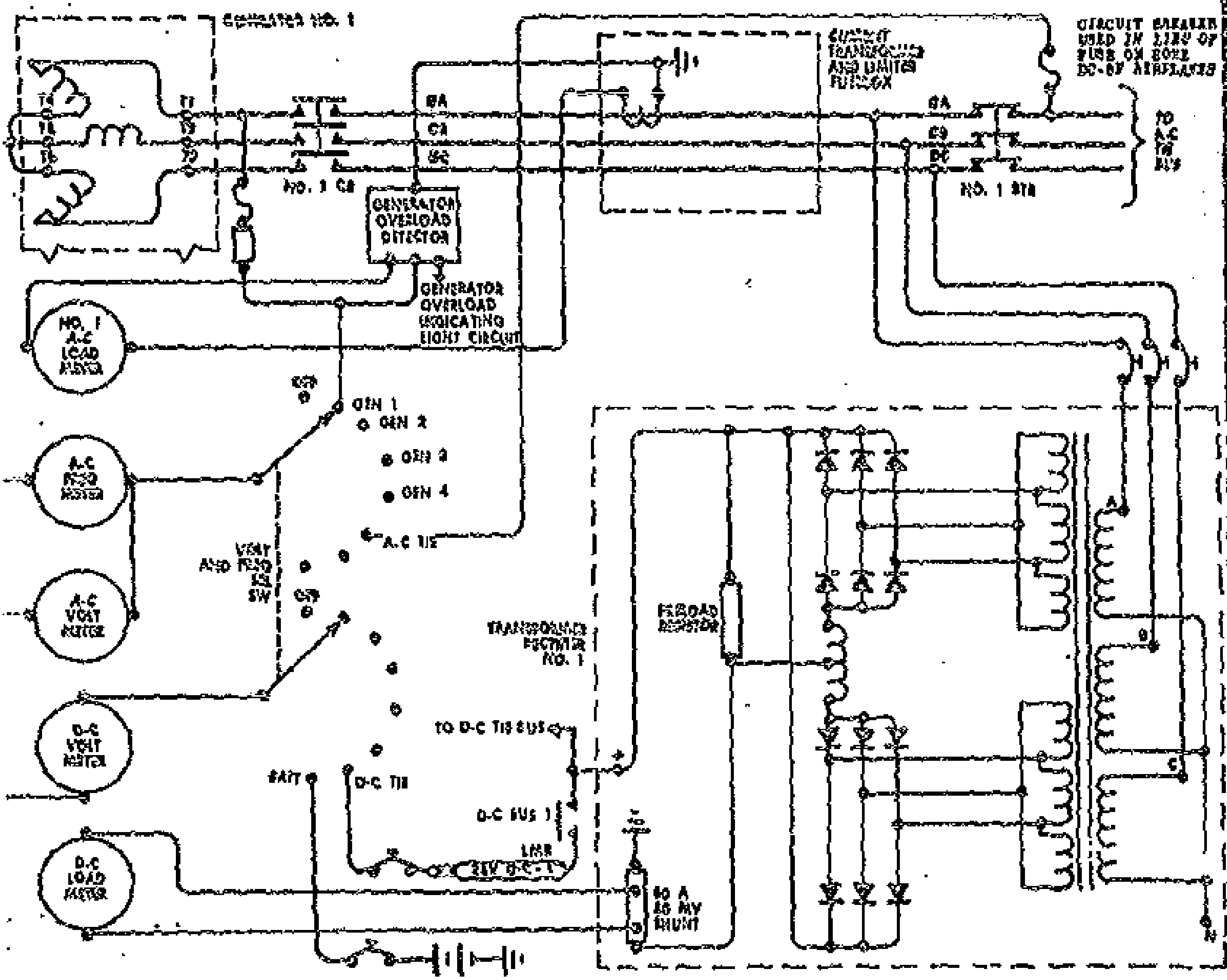
2. <u>Controls and Indications</u> (See Figures 4 and 5.)

A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contains the controls and indications for the individual systems used on the airplane.

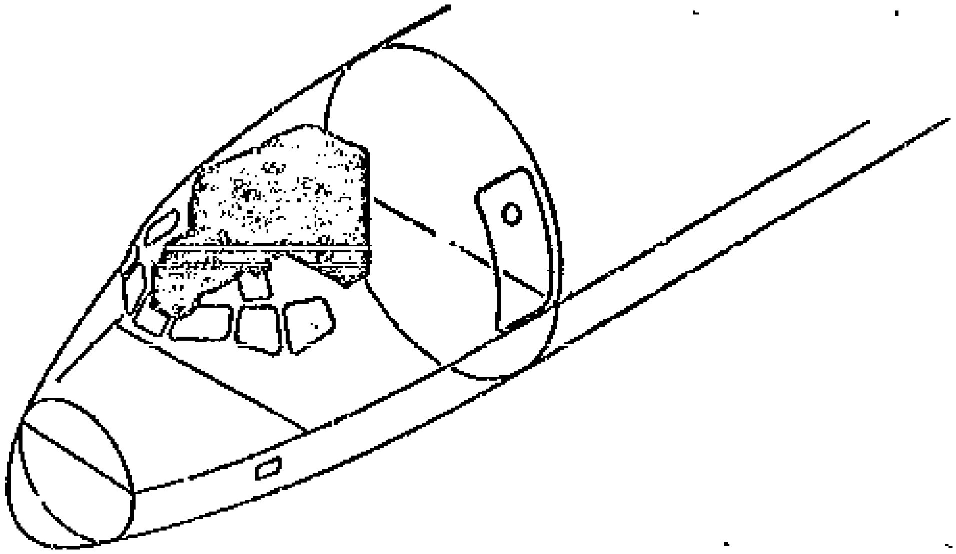


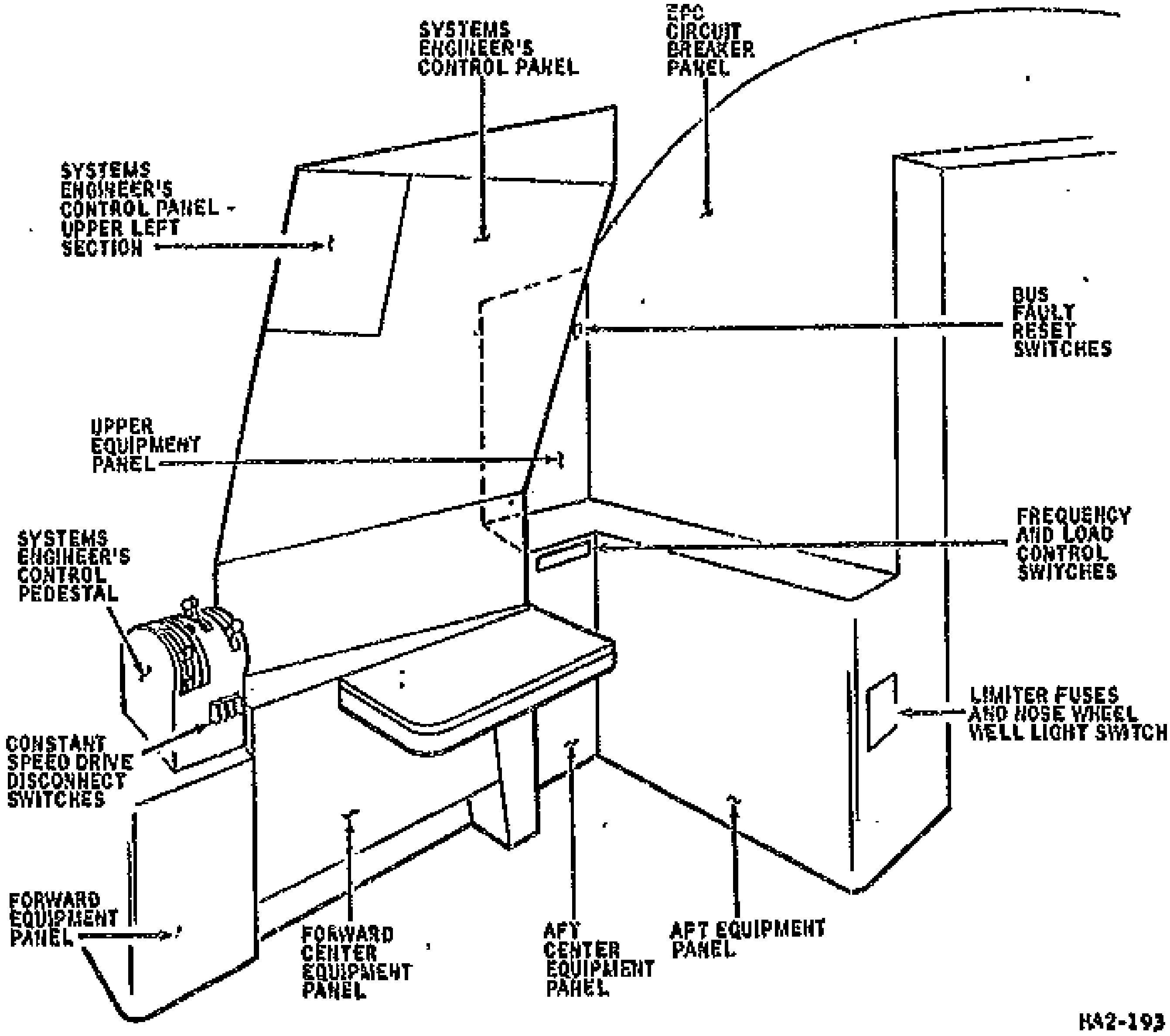
HA2-192A

Dc Power Distribution -- Block Diagram
Figure 3

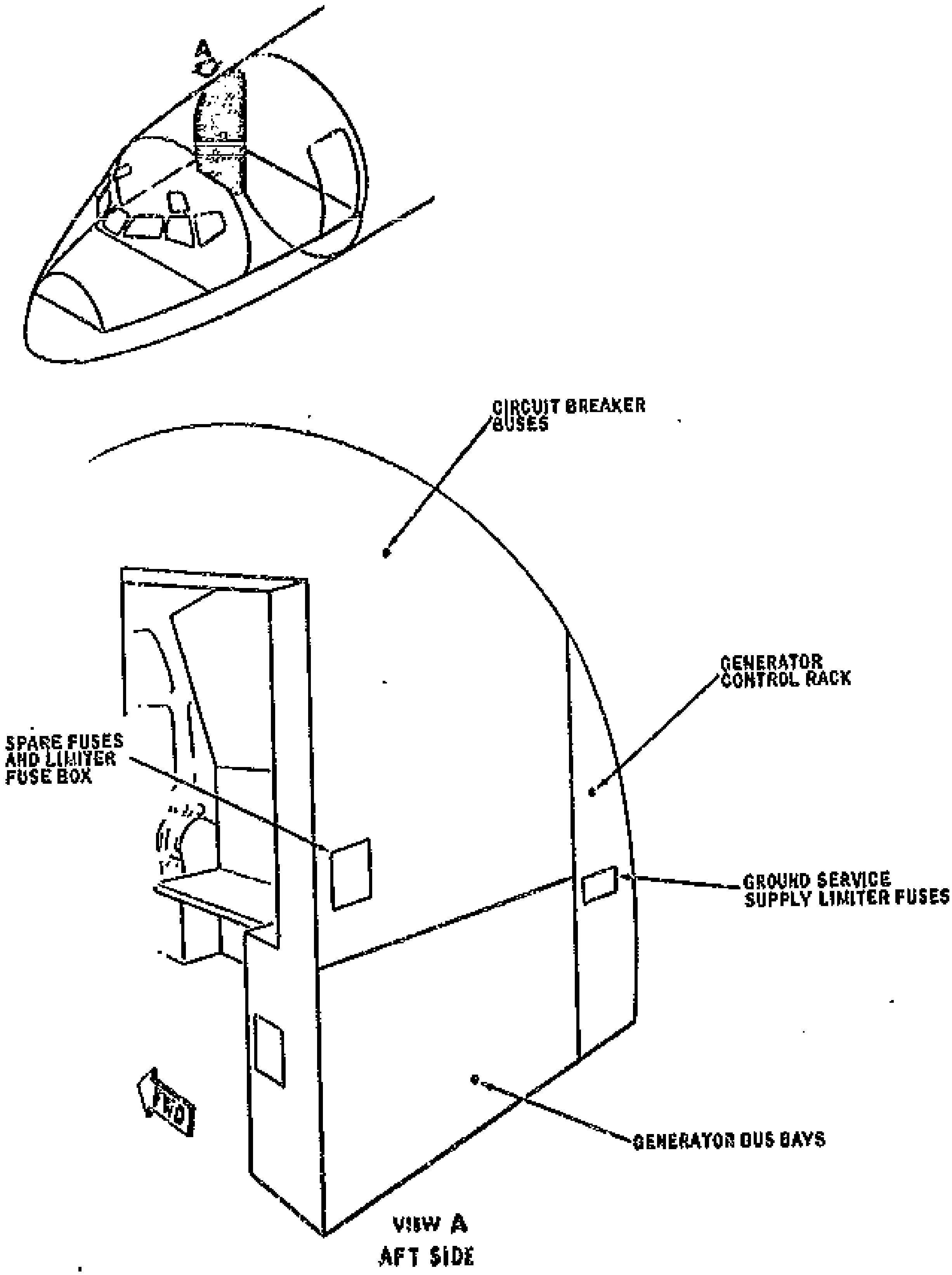


Ac and Dc Monitoring Instrumentation
Figure 4





Electrical Power Center and
Systems Engineer's Station
Figure 5 (Sheet 1)



Electrical Power Center and
Systems Engineer's Station
Figure 5 (Sheet 2)

B. Bus fault reset switches are located on the upper equipment panel. The aft center equipment panel contains the frequency and load control switches. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the section of the systems engineer's control panel (see Figure 6).

3. Electrical Power Limitations

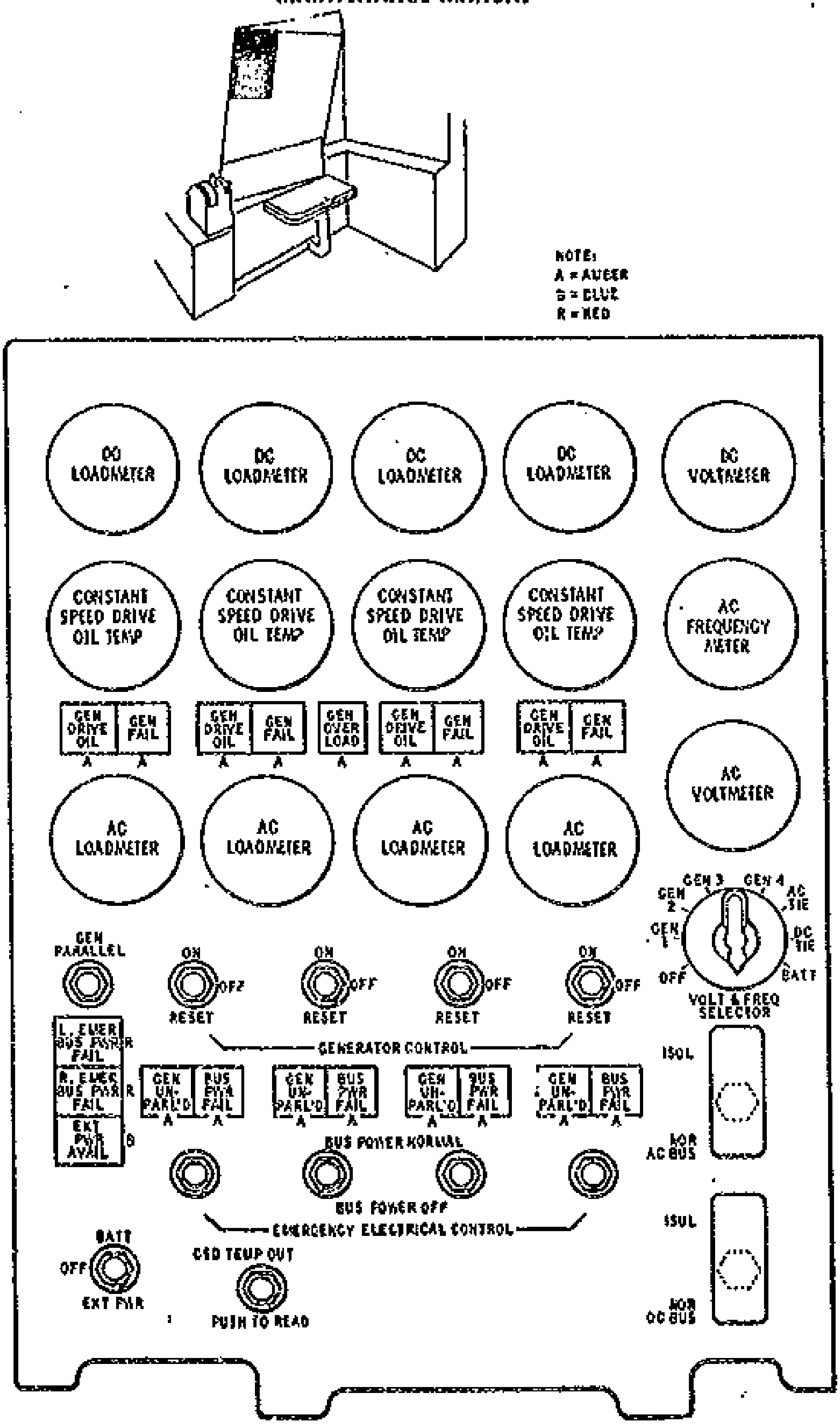
A. The values shown in the normal column are normal operating ranges. Indications outside the normal range indicate possible system abnormalities.

B. Limits shown in the allowable column should not be exceeded, and sustained operation at these limits is not recommended.

CAUTION: DAMAGE TO ELECTRICAL EQUIPMENT OF AIRPLANE IS POSSIBLE IF AC ELECTRICAL SYSTEMS HAVE BEEN SUBJECTED TO VOLTAGES HIGHER THAN 130 VOLTS, PHASE-TO-NEUTRAL, OR 225 VOLTS, PHASE-TO-PHASE, DUE TO ANY MISADJUSTMENT OF EXTERNAL POWER SUPPLY. ANY AC OVERVOLTAGE APPLIED TO TRANSFORMER-RECTIFIERS WILL RESULT IN DC OVERVOLTAGE BEING APPLIED TO DC EQUIPMENT. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

CAUTION: ANY CONDITION THAT CAUSES ANY INDICATION IN ALLOWABLE COLUMN, OTHER THAN WITHIN NORMAL RANGE, SHOULD BE CORRECTED AT EARLIEST OPPORTUNITY.

	Normal	Allowable	
	Min or Max	Min	Max
Ac voltmeter (external power or generator operation see NOTE 1)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus see NOTE 1)	396 to 404 cps	380 cps	420 cps



HA2-194B

Systems Engineer's Control Panel --
Upper Left Section
Figure 6

	Normal	Allowable	
	Min or Max	Min	Max
Frequency meter (generator operation)	398 to 402 cps	380 cps	420 cps
Dc voltmeter (battery operation)	Not less than 24 volts	22 volts	
Dc voltmeter (external power on generator operation)	25 to 29 volts	24 volts	30 volts
Ac loadmeter (paralleled flight operation)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.0
Ac loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0.		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37.		

	Normal	Allowable	
	Min or Max	Min	Max
Dc loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load.	Zero	1.3
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - DESCRIPTION AND OPERATION

1. Description (See Figure 1.)

   A. Electrical power used on the airplane consists of alternating current and direct current generation with corresponding distribution systems. Four brushless, air-cooled, engine-driven, ac generators provide 120/208 volt, 3-phase, 400-cycle per second (cps) alternating current. The 28-volt, direct current requirements are met by four 50-ampere, unregulated transformer-rectifiers and a 24-volt, nickel-cadmium battery.

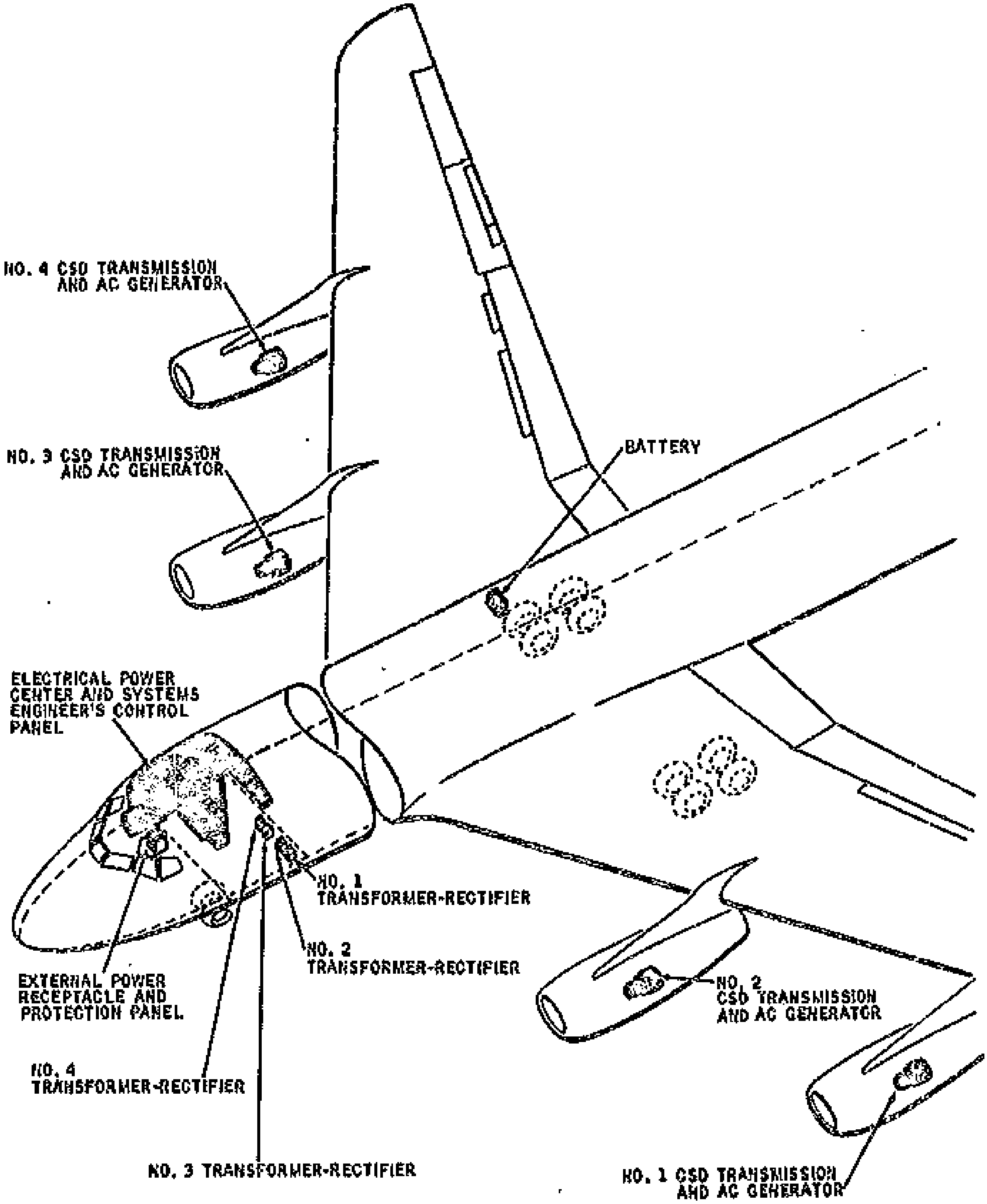
   B. Generator speeds are held constant at 6000 rpm, during all variations of engine speeds between idle and takeoff, by a gear-differential constant-speed drive (CSD) transmission. Frequency is maintained at 400 (±4) cps by the CSD transmission speed governor.

   C. Transmission output rotation can be stopped, under specific procedures, by placing the corresponding generator CSD disconnect switch in the disconnect position. When disengaged, the transmission must not be re-engaged until the engine is shut down and comes to a complete stop. Re-engagement of the transmission is accomplished manually by pulling the disconnect reset handle until a stop is felt and then releasing the handle.

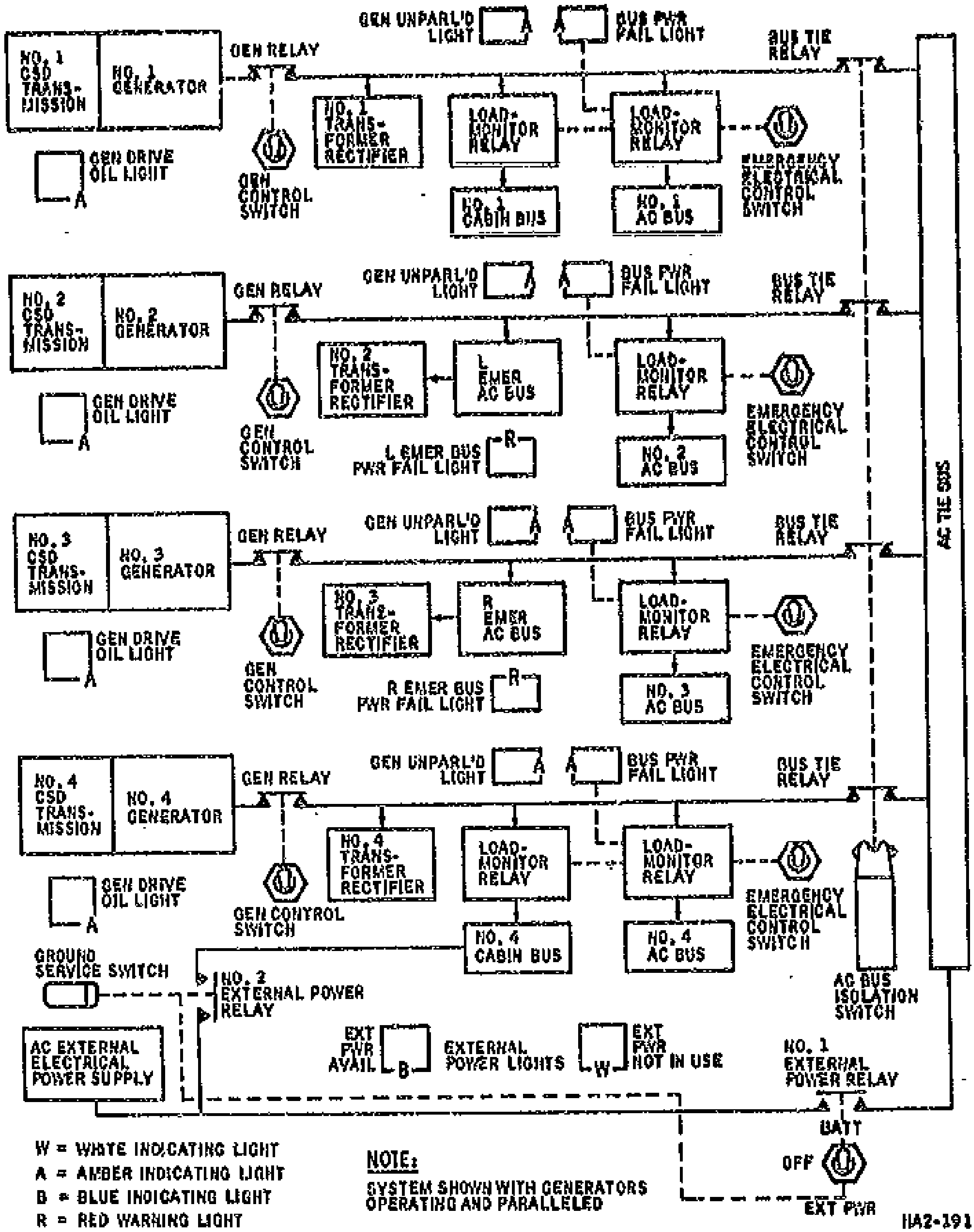
   D. The ac system is arranged so that each generator is connected through a generator relay to a corresponding generator bus (see Figure 2). Each generator bus is connected to the ac tie bus through a bus tie relay and to corresponding load buses through load monitor relays. In addition, the No. 2 generator bus is connected directly to the left ac emergency bus, and the No. 3 generator bus is connected directly to the right ac emergency bus.

   E. The generators can be operated unparalleled as separate systems, each supplying power to corresponding buses, or paralleled with all operating generators equally sharing the total electrical loads. Paralleled operation is preferred. If a generator fails to function, continuity of electrical power to the dead bus is assured by the paralleling circuit which initiates an equal load distribution among the remaining operating generators. An ac bus isolation switch can be operated to isolate the ac buses and to prevent parallel operation.

   F. During unparalleled operation, power supply to the ac tie bus is assured by the preferential circuit if the ac bus isolation switch is closed. The preferential order is 2-3-1-4; and the first operative generator in that order, always starting with No. 2, connects to the ac tie bus. If a generator fails to function during unparalleled operation, the generator supplying power to the ac tie bus will also supply power to the dead buses of the failed generator.



Electrical Power System Installations
Figure 1



Ac Power Distribution -- Block Diagram
Figure 2

G. The dc system is supplied power from four 50-ampere, unregulated transformer-rectifier units which convert ac to dc for the required 28-volt direct current loads (see Figure 3). The input is 3-phase, 400-cps, 115-volt ac power; the output is 28-volt dc power. Power from each transformer-rectifier is supplied to a corresponding load bus through a load monitor relay. Power is supplied to the dc tie bus directly from the No. 1 transformer-rectifier and through isolation relays from No. 2, 3, and 4 transformer-rectifiers. Power from No. 2 and 3 transformer-rectifiers is supplied directly to the left and right dc emergency buses, respectively. The transformer-rectifiers normally operate in parallel. A dc bus isolation switch can be operated for unparalleled operation.

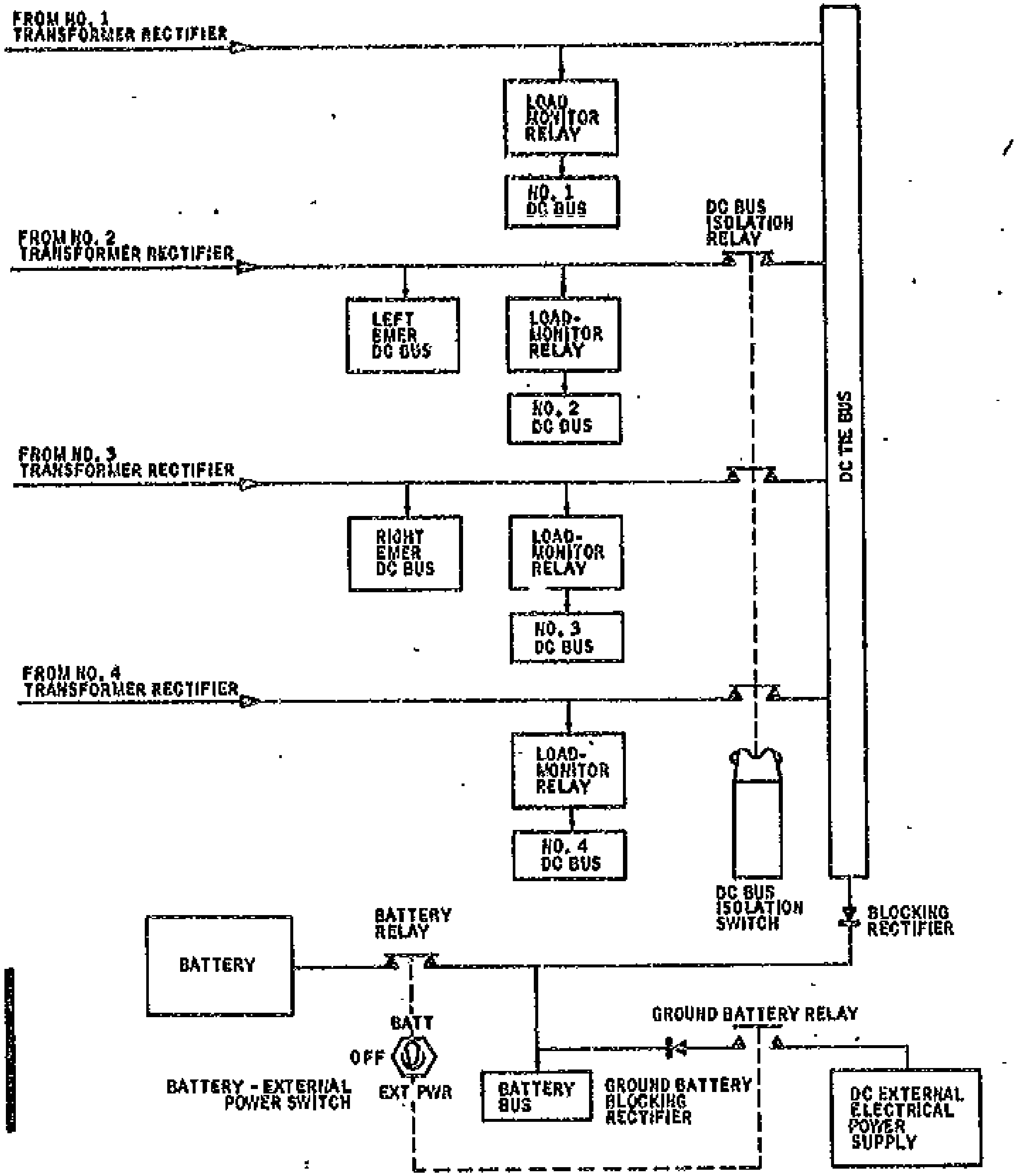
H. All ac and dc load buses can be disconnected from the respective power sources by actuation of emergency electrical control switches. If the generators are operating in parallel when the switches are actuated, the generators continue to operate in parallel to supply power to the left and right ac emergency buses through the ac tie bus and the ac bus tie relays. All transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. If the generators are operating unparalleled when the emergency electrical control switches are actuated, power is supplied to the left and right ac emergency buses from the respective generator bus, and the transformer-rectifiers continue to operate in parallel to supply power to the left and right dc emergency buses. Only one ac bus and one dc bus need be energized for safe control of the airplane.

I. The 24-volt dc system can also be supplied power from a 24-volt, nickel-cadmium battery. The battery is connected to the battery bus through a battery relay. The battery bus is normally powered from the dc tie bus through a blocking rectifier. The blocking rectifier permits the battery to receive charging current when the dc tie bus is powered but prevents the battery from discharging into loads connected to the tie bus when the bus is not powered.

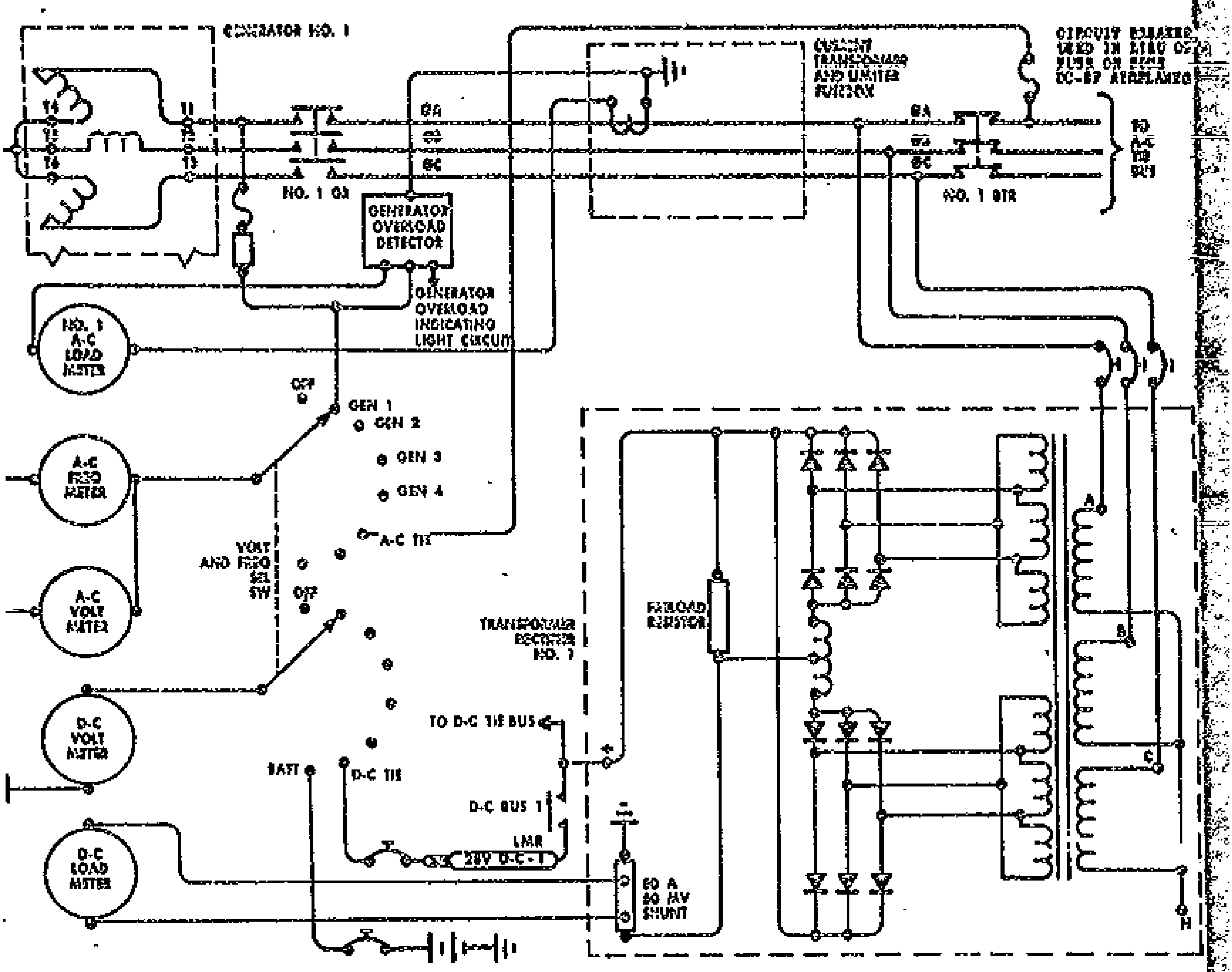
J. An external power receptacle enables the connection of a 400-cycle, 3-phase, 120/208-volt external power source to energize the airplane electrical circuits.

2. Controls and Indications (See Figures 4 and 5.)

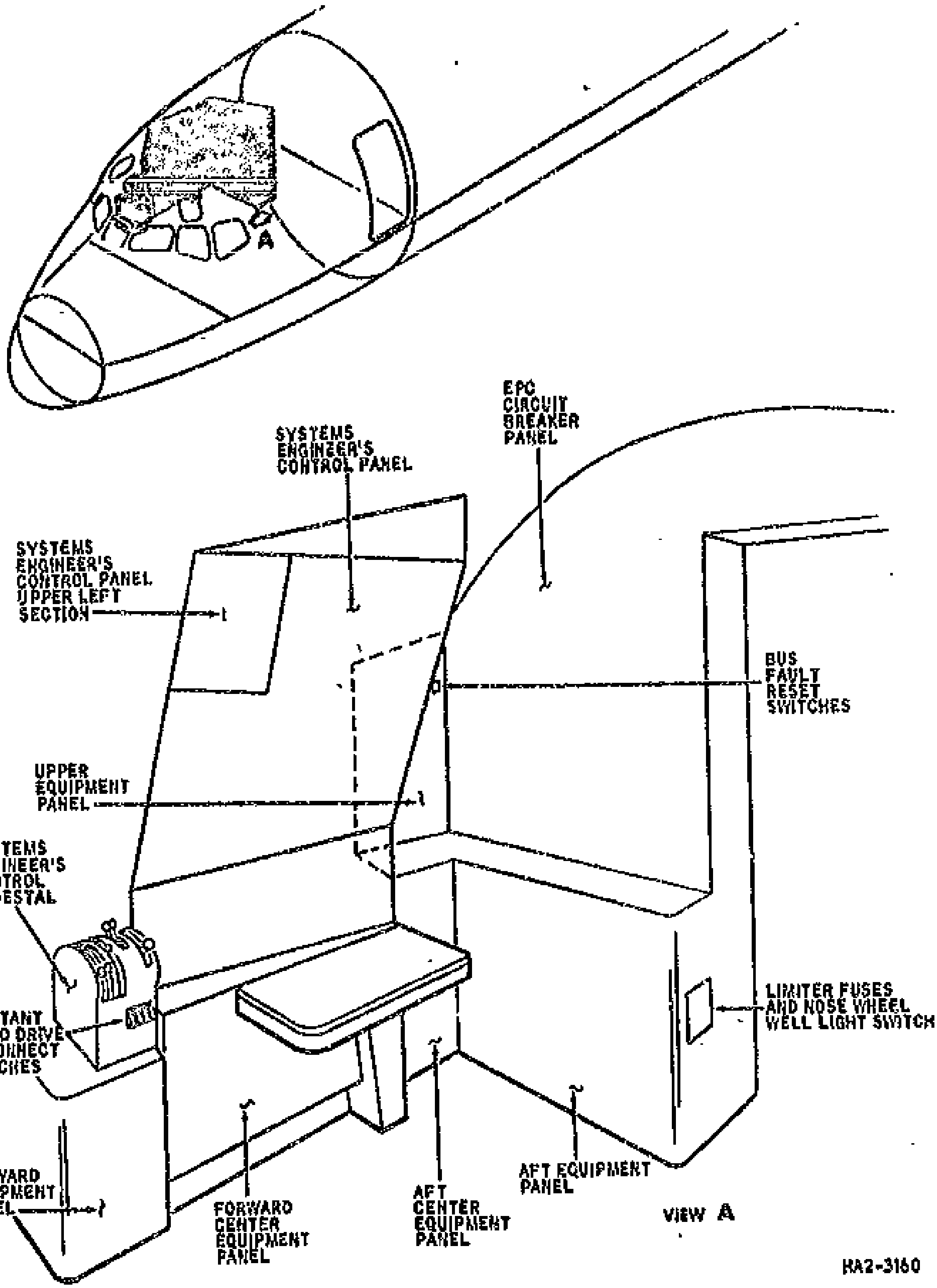
A. The electrical power center and systems engineer's station provides a central location for electrical load distribution and contains the controls and indications for the individual systems used on the airplane.



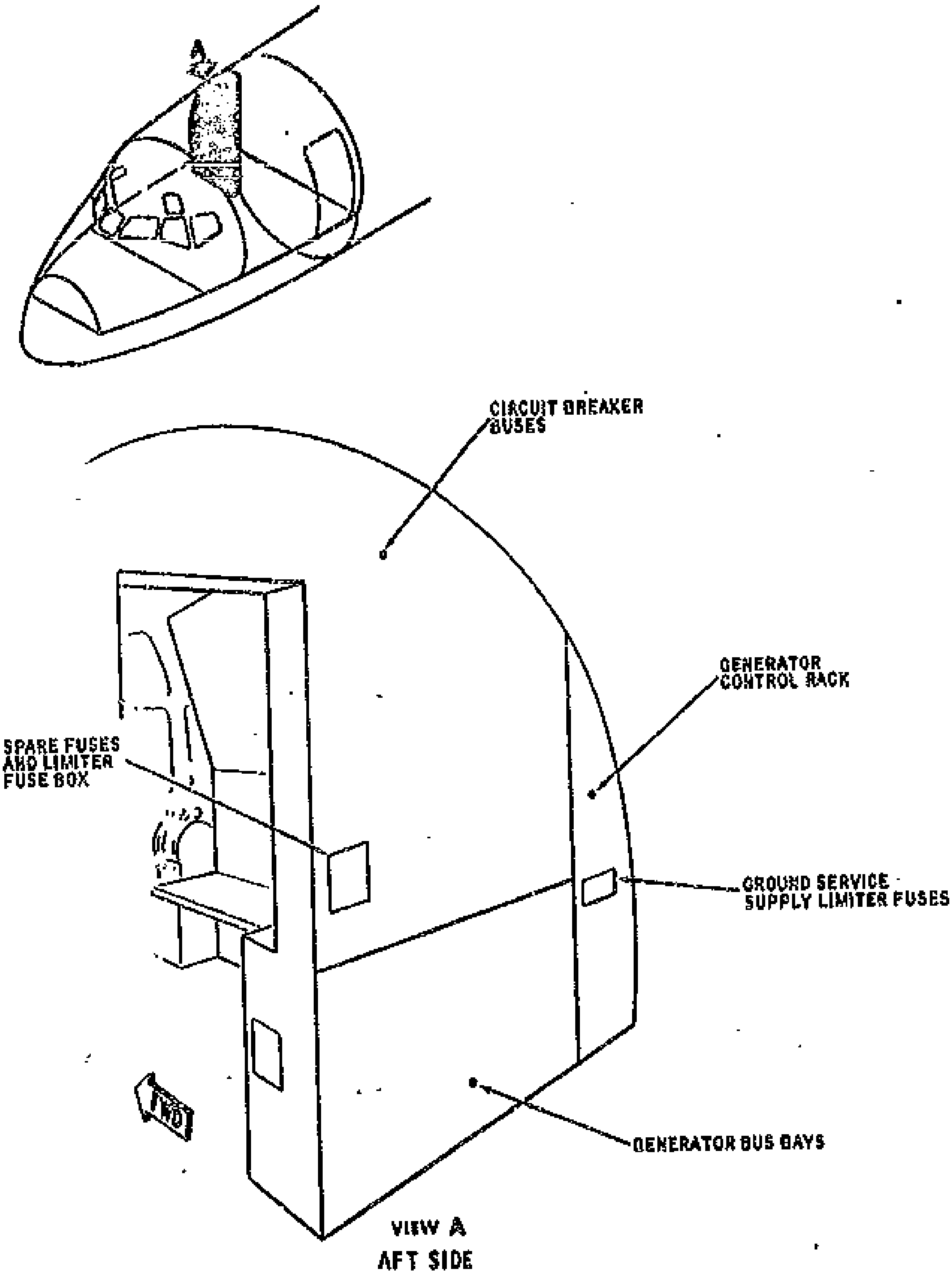
Dc Power Distribution -- Block Diagram
Figure 3



Ac and Dc Monitoring Instrumentation
Figure 4



Electrical Power Center and Systems Engineer's Station
Figure 5 (Sheet 1)



HA2-1830

Electrical Power Center and Systems Engineer's Station
Figure 5 (Sheet 2)

B. Bus fault reset switches are located on the upper equipment panel. Constant speed drive disconnect switches for disengaging each CSD transmission are located on the systems engineer's control pedestal. The circuit breaker buses, limiter fuses, generator control rack, and generator bus bays are located on the aft side of the electrical power center.

C. Control switches, instruments, and indicating lights for monitoring and controlling the electrical power system are located on the upper left section of the systems engineer's control panel (see Figure 6).

3. Electrical Power Limitations

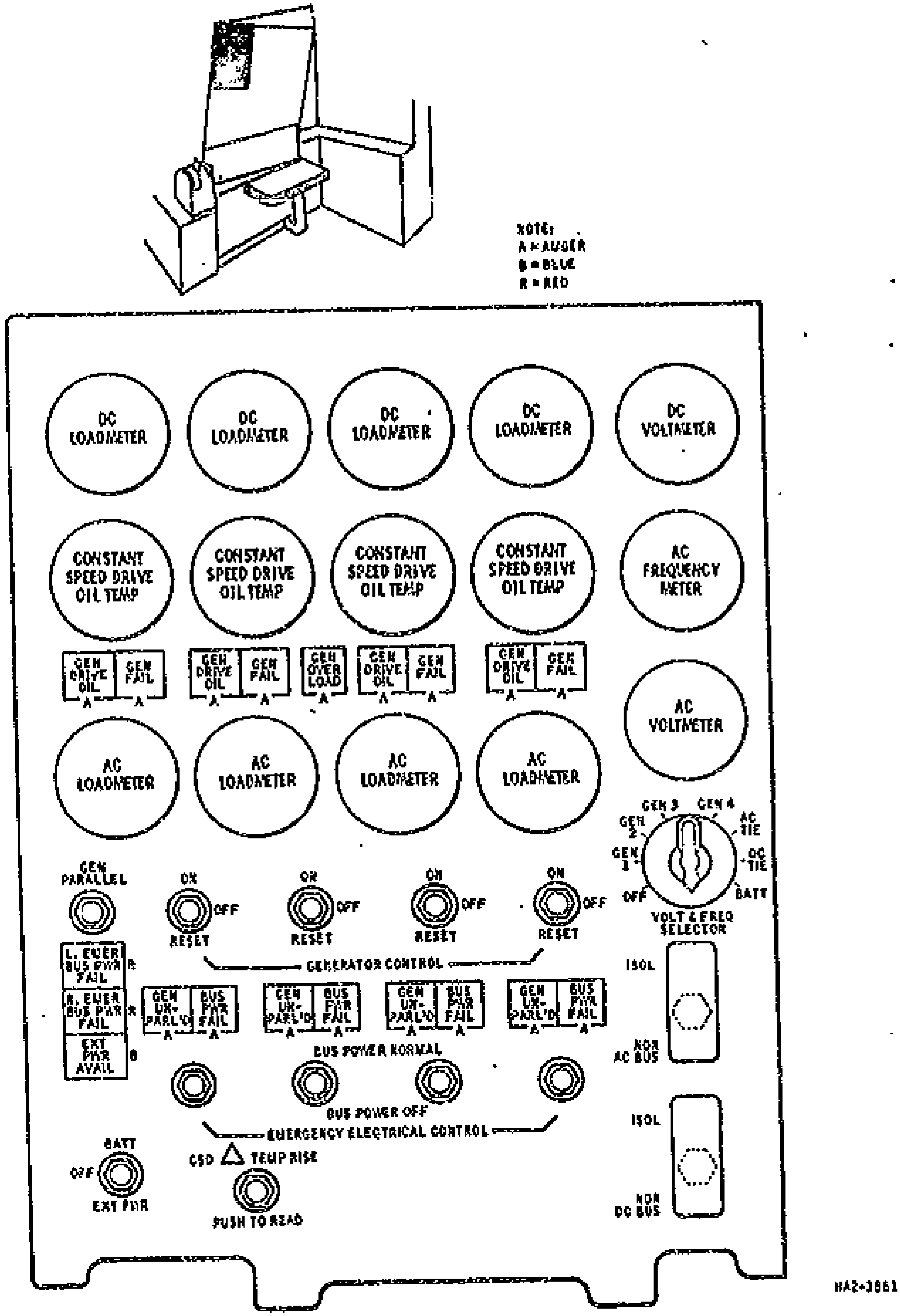
A. The values shown in the normal column are normal operating ranges. Indications outside the normal range indicate possible system abnormalities.

B. Limits shown in the allowable column should not be exceeded, and sustained operation at these limits is not recommended.

CAUTION: DAMAGE TO ELECTRICAL EQUIPMENT OF AIRPLANE IS POSSIBLE IF AC ELECTRICAL SYSTEMS HAVE BEEN SUBJECTED TO VOLTAGES HIGHER THAN 130 VOLTS, PHASE-TO-NEUTRAL, OR 225 VOLTS, PHASE-TO-PHASE, DUE TO MISADJUSTMENT OF EXTERNAL POWER SUPPLY. ANY AC OVERVOLTAGE APPLIED TO TRANSFORMER-RECTIFIERS WILL RESULT IN DC OVERVOLTAGE BEING APPLIED TO DC EQUIPMENT. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

CAUTION: ANY CONDITION THAT CAUSES ANY INDICATION IN ALLOWABLE COLUMN, OTHER THAN WITHIN NORMAL RANGE, SHOULD BE CORRECTED AT EARLIEST OPPORTUNITY.

	Normal	Allowable	
	Min or Max	Min	Max
Ac voltmeter (external power or generator operation see NOTE 1)	112 to 118 volts	107 volts	123 volts
Frequency meter (external power on tie bus see NOTE 1)	396 to 404 cps	380 cps	420 cps
Frequency meter (generator operation)	396 to 404 cps	380 cps	420 cps



Systems Engineer's Control Panel -- Upper Left Section
Figure 6

	Normal	Allowable	
	Min or Max	Min	Max
Dc voltmeter (battery operation)	Not less than 24 volts	22 volts	
Dc voltmeter (external power or generator operation)	25 to 29 volts	24 volts	30 volts
Ac loadmeter (paralleled flight operation)	With ±0.1 of average load with total load not less than 2.0 as specified in Note 2	Zero	1.37
Ac loadmeter (unparalleled, flight operation)	Over zero and under 1.37	Zero	1.37
Ac loadmeter (paralleled, ground operation, see Note 3)	Within ±0.1 of average load with total load not less than 2.0, as specified in Note 2	Zero	1.0
Ac Loadmeter (unparalleled, ground operation, see Note 3)	Over zero and under 1.0	Zero	1.0
Generator overload light (ground operation)	Light should come on between loadmeter indication of 0.94 and 1.0		
Generator overload light (flight operation)	Light should come on between loadmeter indication of 1.29 and 1.37		
Dc loadmeter	Maximum difference between any two indicators should not exceed 0.6, and all indicators should indicate some load.	Zero	1.3

	Normal	Allowable	
	Min or Max	Min	Max
CSD transmission oil temperature rise	Zero to 11°C		17°C
CSD transmission outlet oil temperature	20° to 132°C		146°C

NOTE 1: If external power is not within normal limits, correction shall be made as soon as possible.

NOTE 2: Average load is related only to generators in parallel and equals the total of associated loadmeter readings divided by the number of generators in parallel.

NOTE 3: Generator overload ratings for short-time operation are:

(a) 1.5 for 5 minutes

(b) Over 1.5 for 5 seconds (the overload rating of the generator is 2.0 for 5 seconds).

GENERAL - REMOVAL/INSTALLATION

1. General

   A. Removal and installation instructions for components of the electrical system requiring special attention are outlined in procedural steps, to enable the job to be performed easily and efficiently.

   B. Removal and installation instructions are not given for components that are secured in position with standard bolts or screws, or secured in a mount assembly with knurled nuts, as removal/installation is obvious. Some components have electrical connectors and/or terminals that need to be disconnected before removal, while other components have an electrical connector that is an integral part of the component. This type connector is usually found on components that are installed on a mount assembly and are mated to a receptacle installed on the mount when the component is properly seated in the mount. When electrical equipment is removed, the receptacle and the plug of the connector should be protected from the entrance of material that may cause damage to the pins or shorting when power is applied to the circuit. (See Figures 401 and 402.)

   C. When replacing defective equipment use equipment that has an identical part number unless the use of substitute equipment has been authorized. After installation of serviceable equipment, adjustment/tests should be conducted to ensure that the applicable system is operating properly.

   D. Paragraph 2 describes typical removal and installation of a rack-mounted component and of a relay. Procedures may vary slightly with each individual component or relay.

2. Removal/Installation

   A. Remove Rack-Mounted Components

      (1) Remove electrical power from unit by either step (a) or (b).

         (a) Open applicable circuit breaker(s).

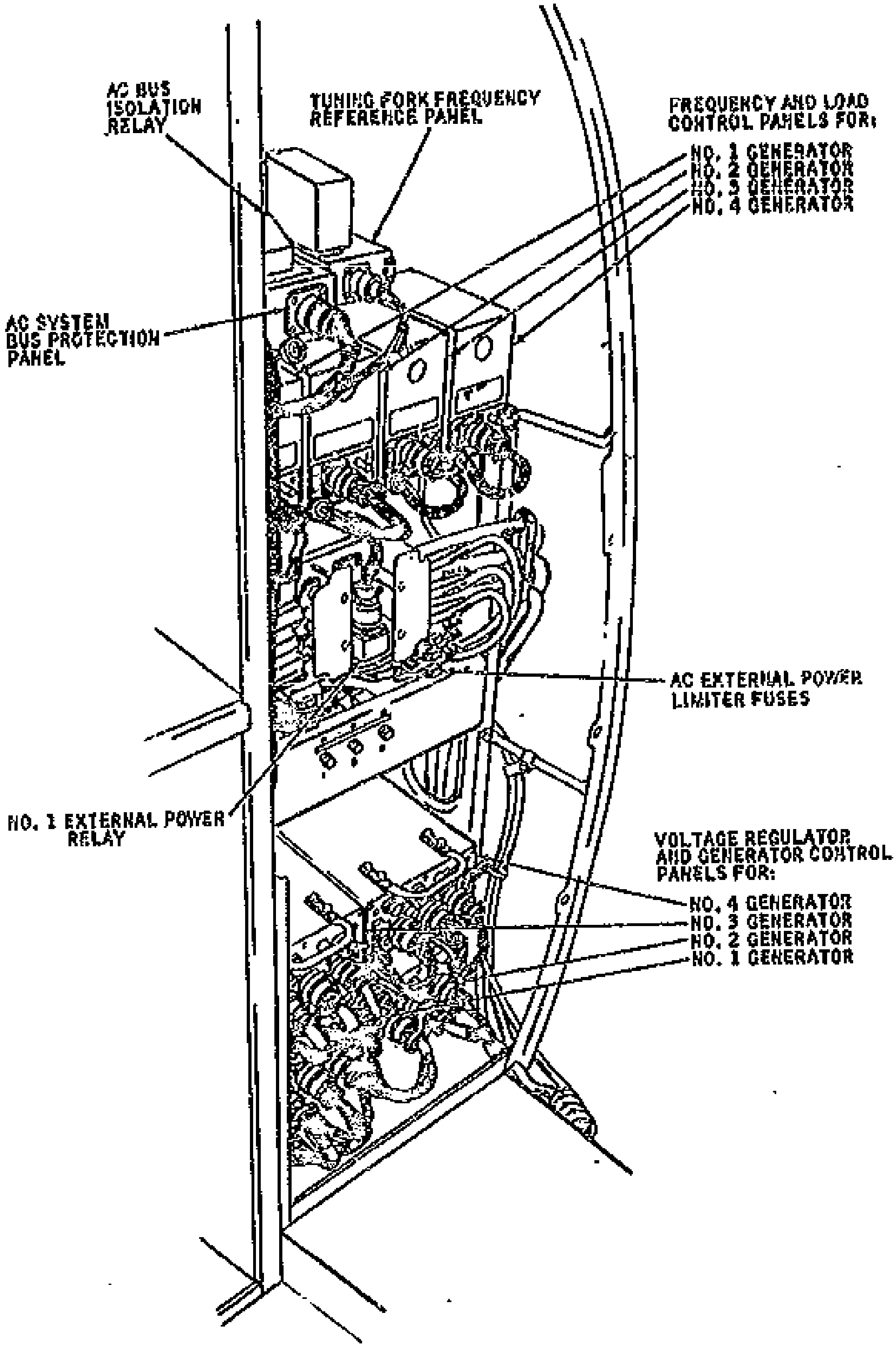
            1) Install clamp under open circuit breaker(s). Suitable clamp is HPV-5N (Burndy) or P4-5WS (Nylon Molding Corporation).

            2) Tag circuit breaker(s) with warning sign.

               WARNING: DO NOT CLOSE THIS CIRCUIT BREAKER. THIS CIRCUIT BREAKER MUST REMAIN OPEN UNTIL COMPLETION OF MAINTENANCE WORK.

         (b) Disconnect external power. Tag external power receptacle with warning sign.

            WARNING: DO NOT APPLY EXTERNAL POWER.



Generator Control Rack
Figure 401

(2) Gain access to unit.

(3) Disconnect electrical connectors; cap connectors and receptacles.

NOTE: This step is not applicable to units having an integral electrical connector.

(4) Loosen knurled nuts on holddown assemblies.

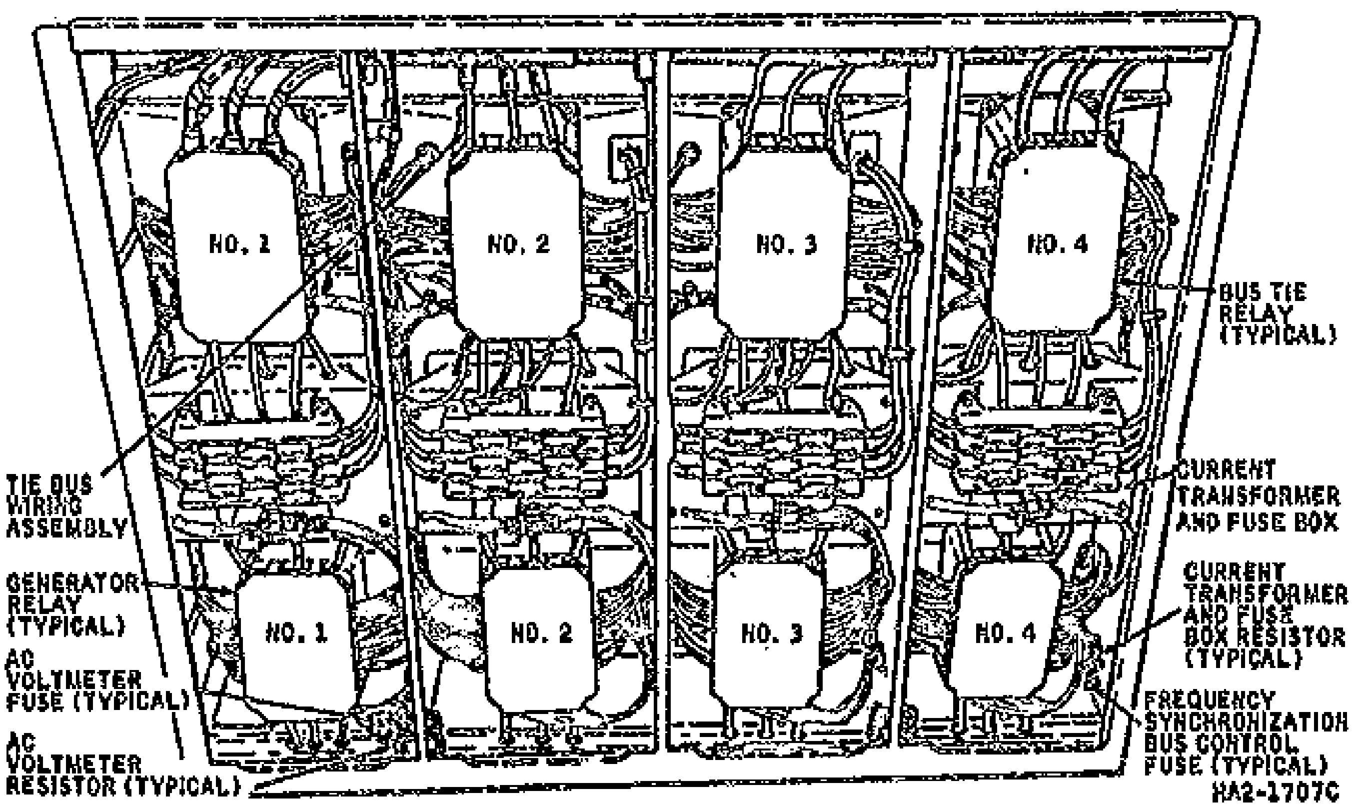
(5) Disengage holddown assemblies from mounting brackets.

(6) Pull unit from mount.

CAUTION: TO PREVENT DAMAGE TO ENGAGING PINS AND ELECTRICAL CONNECTOR, DO NOT RAISE UNIT WHEN PULLED FROM MOUNT.

B. Install Rack-Mounted Components

(1) Make certain that power is removed, as called out in paragraph 2, step A (1).



Generator Bus Bays
Figure 402

(2) Place unit on mount and slide in as far as it will go. Do not raise unit.

CAUTION: IF UNIT BEING INSTALLED HAS INTEGRAL ELECTRICAL CONNECTOR, MAKE CERTAIN THAT CONNECTOR IS PROPERLY MATED WITH RECEPTACLE TO PREVENT DAMAGE TO PINS OF CONNECTOR.

(3) Engage holddown assemblies with mounting brackets.

(4) Tighten knurled nuts on holddown assemblies.

(5) Uncap and connect electrical connectors to receptacles on unit.

NOTE: This step is not applicable to units having an integral electrical connector.

(6) Replace parts removed to gain access to unit.

(7) Remove warning tag. Apply external power or close circuit breaker(s), as applicable.

(8) Follow applicable system adjustment/test procedures to determine that unit is functioning properly.

C. Remove Relay

(1) Remove electrical power from relay by either step (a) or (b).

(a) Open applicable circuit breaker(s).

1) Install clamp under open circuit breaker(s). Suitable clamp is HPV-5N (Burndy) or P4-5WS (Nylon Molding Corporation.)

2) Tag circuit breaker(s) with warning sign.

WARNING: DO NOT CLOSE THIS CIRCUIT BREAKER. THIS CIRCUIT BREAKER MUST REMAIN OPEN UNTIL COMPLETION OF MAINTENANCE WORK.

(b) Disconnect external power. Tag external power receptacle with warning sign.

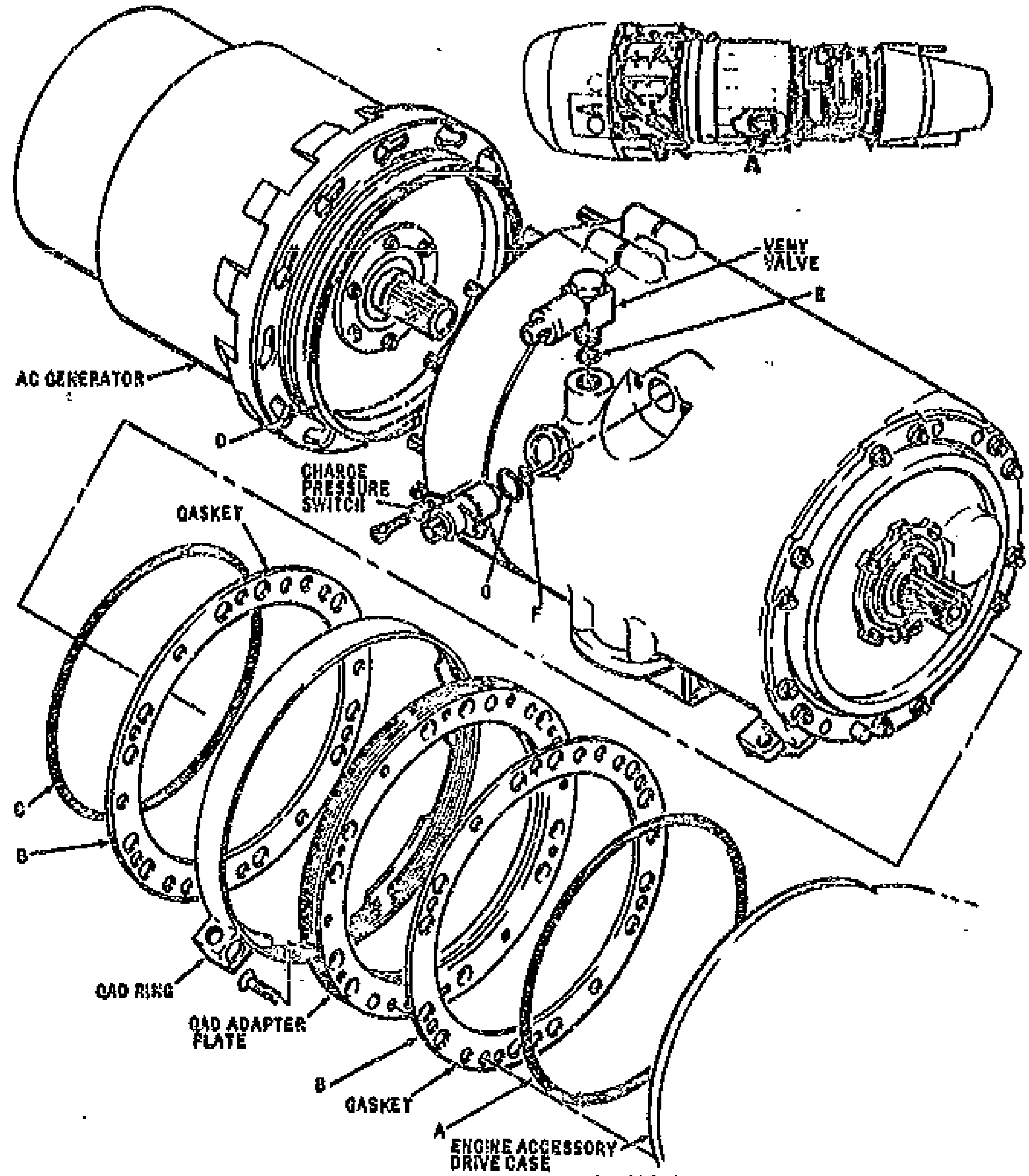
WARNING: DO NOT APPLY EXTERNAL POWER.

(2) Gain access to relay.

(3) Tag and disconnect wires.

(4) Support relay and remove mounting screws.

(5) Remove relay.

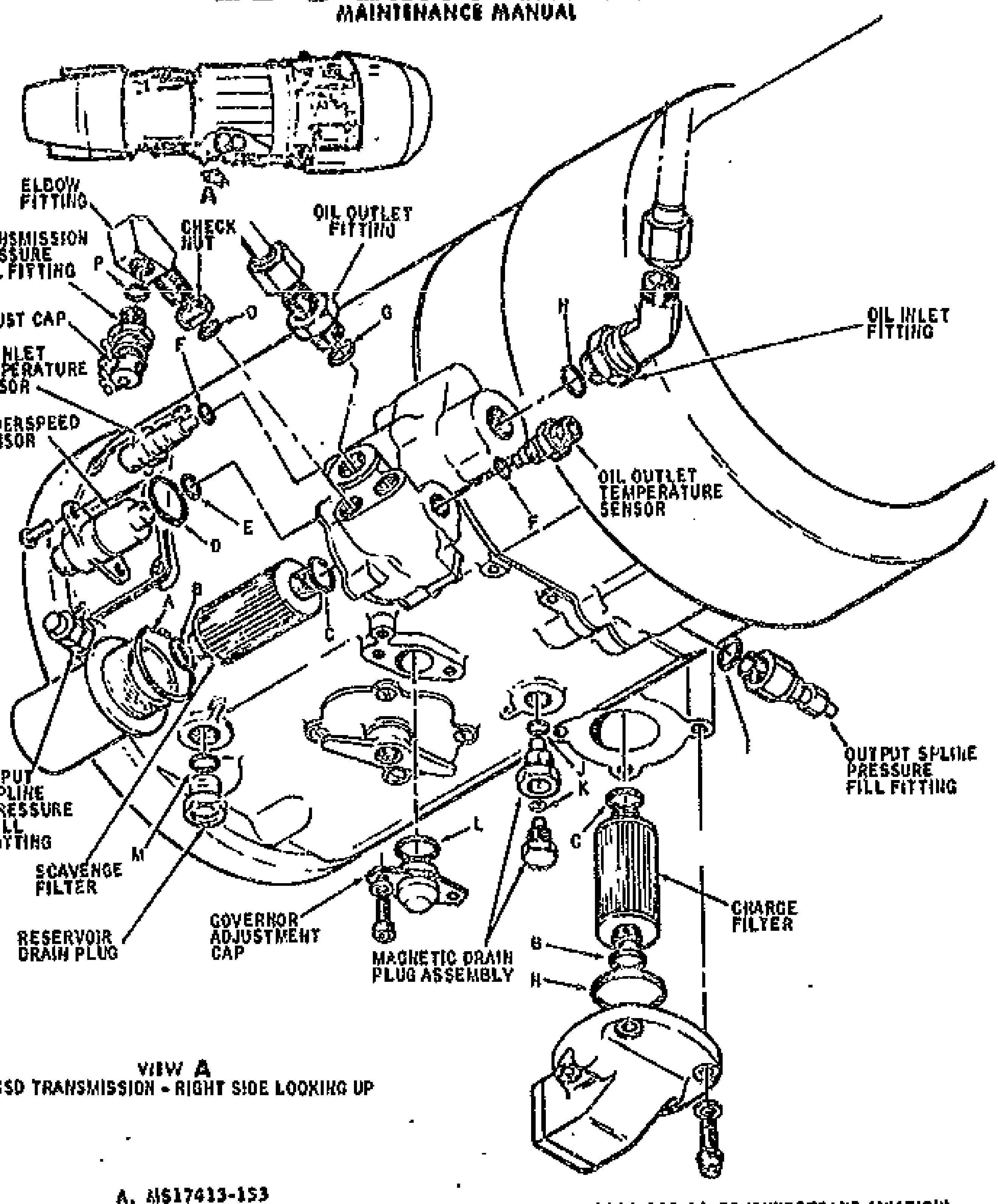


CSD TRANSMISSION - LEFT SIDE
VIEW A

A. 28904-3 (SUNDSTRAND AVIATION)
B. 693206 (SUNDSTRAND AVIATION)
C. MS 17413-270
D. 05-622017 (LEAR-SIEGLER)
E. MS 17413-112
F. MS 17413-011
G. MS 17413-117

HA2-592B

Electrical Power System Components --
O-Ring Installations
Figure 403 (Sheet 1)



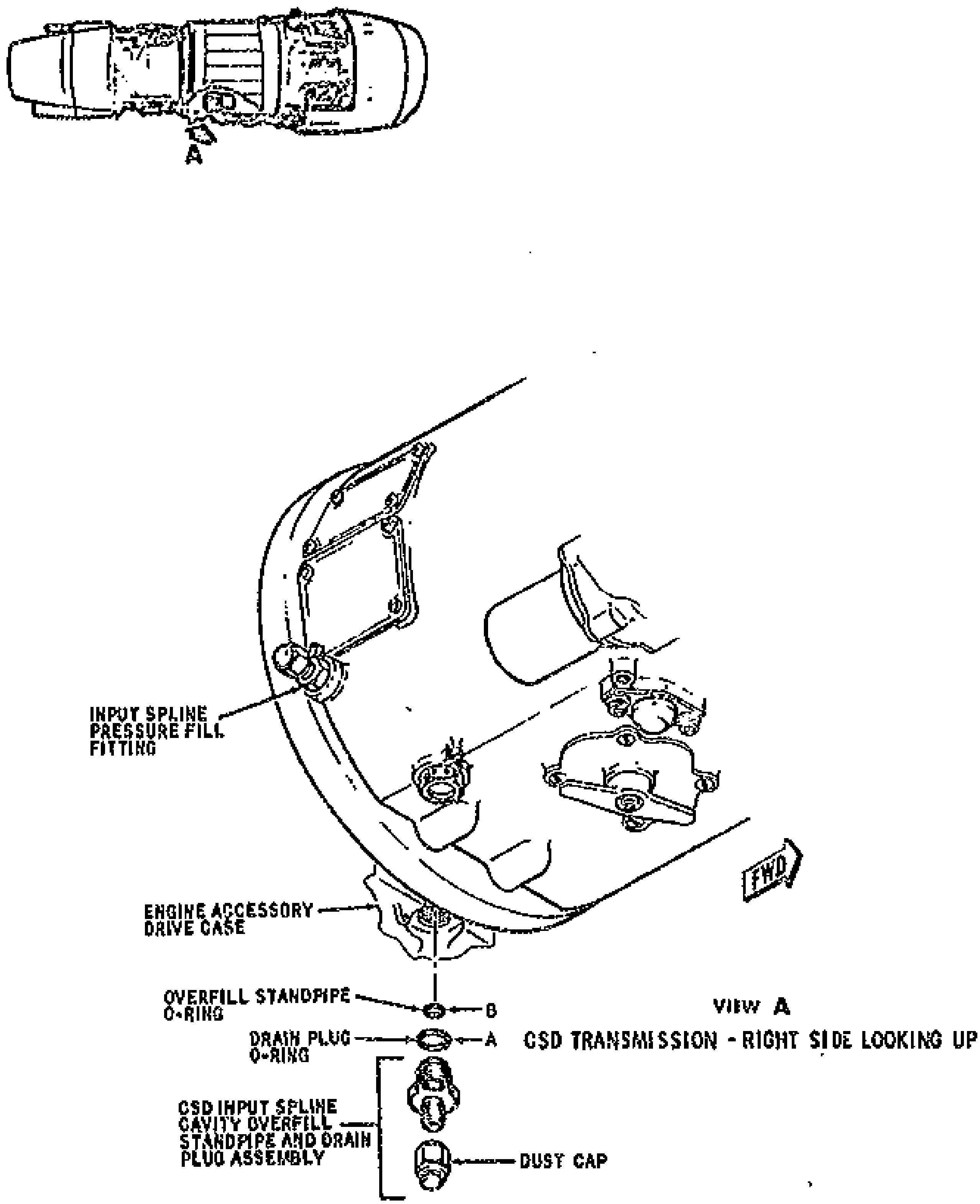
VIEW A
CSD TRANSMISSION - RIGHT SIDE LOOKING UP

A. MS17413-153
B. MS17413-018
C. MS17413-014
D. MS17413-117
E. MS17413-011
F. MS17413-110
G. NAS 617-8
H. NAS 617-10

I. 3634-193-11-70 (SUNDSTRAND AVIATION)
J. MS17413-111
K. 3634-202-11-70 (SUNDSTRAND AVIATION)
L. MS17413-016
M. MS17413-112
N. MS17413-128
O. MS29561-112
P. NAS 617-6

Electrical Power System Components --
O-Ring Installations
Figure 403 (Sheet 2)

HAZ-5939



A. HAS617-8
B. MS29561-011

Electrical Power System Components --
O-Ring Installations
Figure 403 (Sheet 3)

HA2-2706

D. Install Relay

(1) Make certain that power is removed, as called out in paragraph 2, step C (1).

(2) Position relay.

NOTE: Before installation, make certain that paint is removed from relay mounting flange so that a good electrical bond between relay and structure of airplane is provided.

(3) Install and tighten mounting screws.

(4) Connect wires, making certain that leads are connected correctly.

(5) Remove tags from wires.

(6) Replace parts removed to gain access to relay.

(7) Remove warning tag. Apply external power or close circuit breaker(s) as applicable.

(8) Follow applicable system adjustment test procedures to determine that relay is functioning properly.

3. Electrical Power System O-Rings

A. O-rings, used when installing electrical power components and various components on the CSD transmission, are shown and listed by part number in Figure 403.

GENERAL - REMOVAL/INSTALLATION

1. General

   A. Removal and installation instructions for components of the electrical system requiring special attention are outlined in procedural steps, to enable the job to be performed easily and efficiently.

   B. Removal and installation instructions are not given for components that are secured in position with standard bolts or screws, or secured in a mount assembly with knurled nuts, as removal/installation is obvious. Some components have electrical connectors and/or terminals that need to be disconnected before removal, while other components have an electrical connector that is an integral part of the component. This type connector is usually found on components that are installed on a mount assembly and are mated to a receptacle installed on the mount when the component is properly seated in the mount. When electrical equipment is removed, the receptacle and the plug of the connector should be protected from the entrance of material that may cause damage to the pins or shorting when power is applied to the circuit. (See Figures 401 and 402.)

   C. When replacing defective equipment, use equipment that has an identical part number unless the use of substitute equipment has been authorized. After installation of serviceable equipment, adjustment/tests should be conducted to ensure that the applicable system is operating properly.

   D. Paragraph 2 describes typical removal and installation of a rack-mounted component and of a relay. Procedures may vary slightly with each individual component or relay.

2. Removal/Installation

   A. Remove Rack-Mounted Components

      (1) Remove electrical power from unit by either step (a) or (b).

         (a) Open applicable circuit breaker(s).

            1) Install clamp under open circuit breaker(s). Suitable clamp is HPV-5N (Burndy) or P4-5NS (Nylon Molding Corporation).

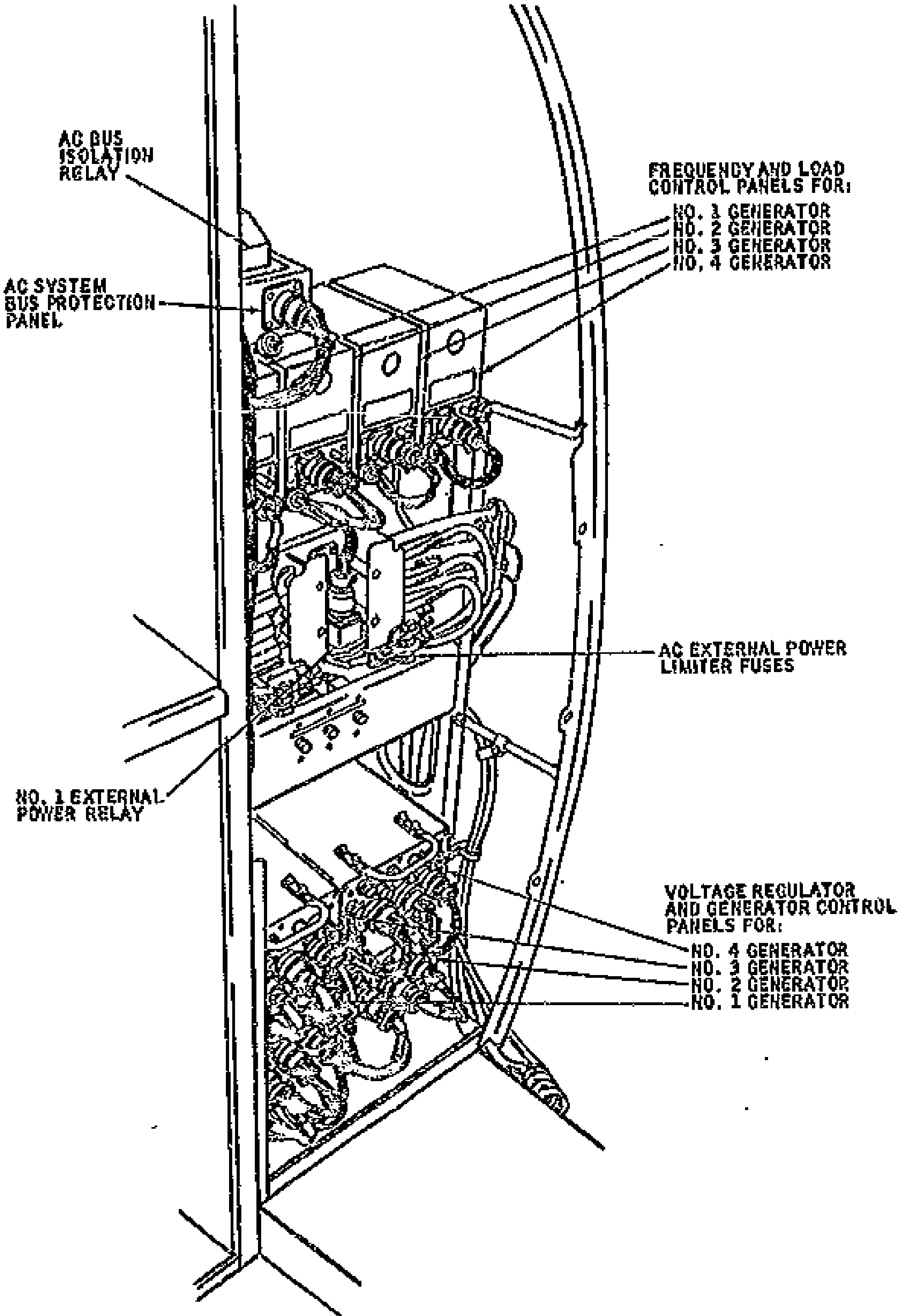
            2) Tag circuit breaker(s) with warning sign.

               WARNING: DO NOT CLOSE THIS CIRCUIT BREAKER. THIS CIRCUIT BREAKER MUST REMAIN OPEN UNTIL COMPLETION OF MAINTENANCE WORK.

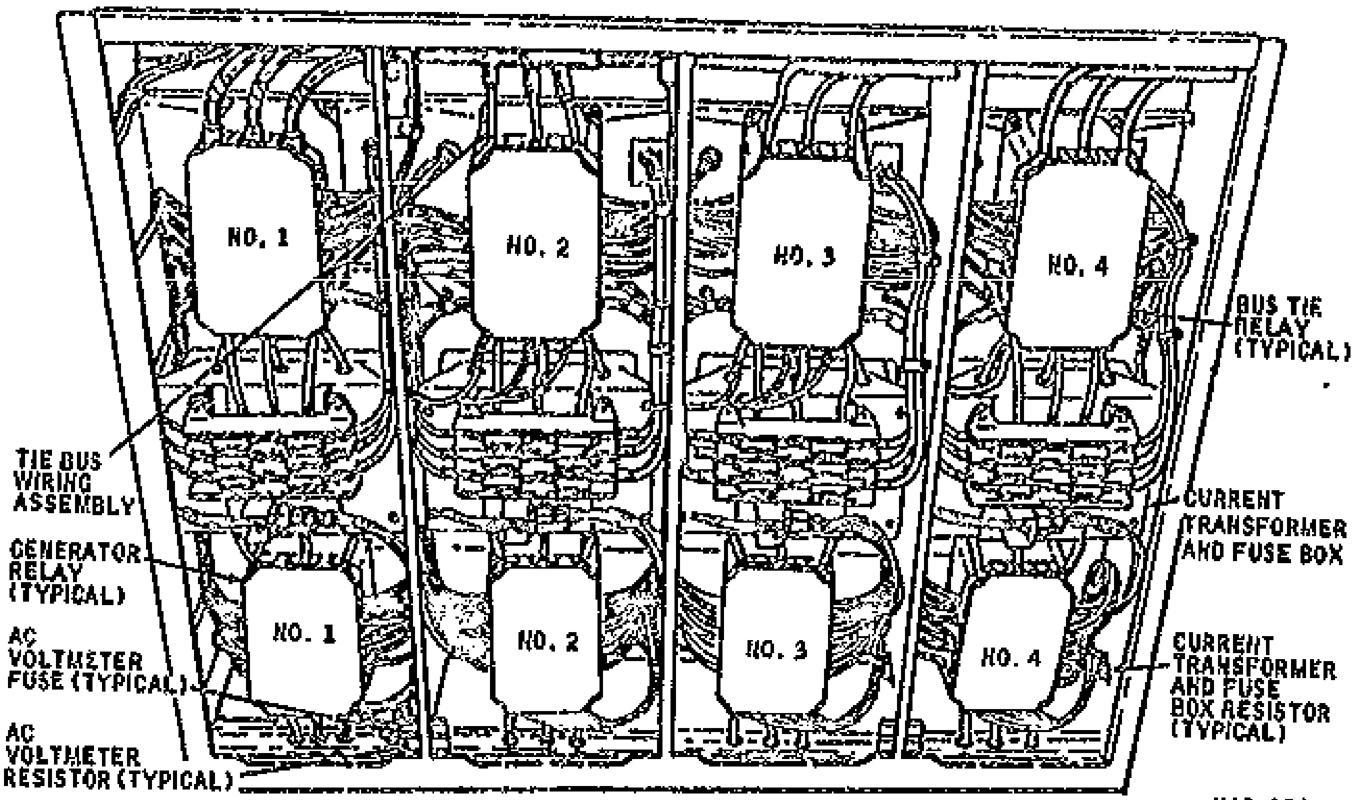
         (b) Disconnect external power. Tag external power receptacle with warning sign.

            WARNING: DO NOT APPLY EXTERNAL POWER.

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Generator Control Rack
Figure 401



Generator Bus Bays
Figure 402

(2) Gain access to unit.

(3) Disconnect electrical connectors; cap connectors and receptacles.

NOTE: This step is not applicable to units having an integral electrical connector.

(4) Loosen knurled nuts on holddown assemblies.

(5) Disengage holddown assemblies from mounting brackets.

(6) Pull unit from mount.

CAUTION: TO PREVENT DAMAGE TO ENGAGING PINS AND ELECTRICAL CONNECTOR, DO NOT RAISE UNIT WHEN PULLED FROM MOUNT.

B. Install Rack-Mounted Components

(1) Make certain that power is removed, as called out in paragraph 2, step A (1).

(2) Place unit on mount and slide in as far as it will go. Do not raise unit.

CAUTION: IF UNIT BEING INSTALLED HAS INTEGRAL ELECTRICAL CONNECTOR, MAKE CERTAIN THAT CONNECTOR IS PROPERLY MATED WITH RECEPTACLE TO PREVENT DAMAGE TO PINS OF CONNECTOR.

(3) Engage holddown assemblies with mounting brackets.

(4) Tighten knurled nuts on holddown assemblies.

(5) Uncap and connect electrical connectors to receptacles on unit.

NOTE: This step is not applicable to units having an integral electrical connector.

(6) Replace parts removed to gain access to unit.

(7) Remove warning tag. Apply external power or close circuit breaker(s), as applicable.

(8) Follow applicable system adjustment/test procedures to determine that unit is functioning properly.

C. Remove Relay

(1) Remove electrical power from relay by either step (a) or (b).

(a) Open applicable circuit breaker(s).

1) Install clamp under open circuit breaker(s). Suitable clamp is HPV-5N (Burndy) or P4-5WS (Nylon Molding Corporation).

2) Tag circuit breaker(s) with warning sign.

WARNING: DO NOT CLOSE THIS CIRCUIT BREAKER. THIS CIRCUIT BREAKER MUST REMAIN OPEN UNTIL COMPLETION OF MAINTENANCE WORK.

(b) Disconnect external power. Tag external power receptacle with warning sign.

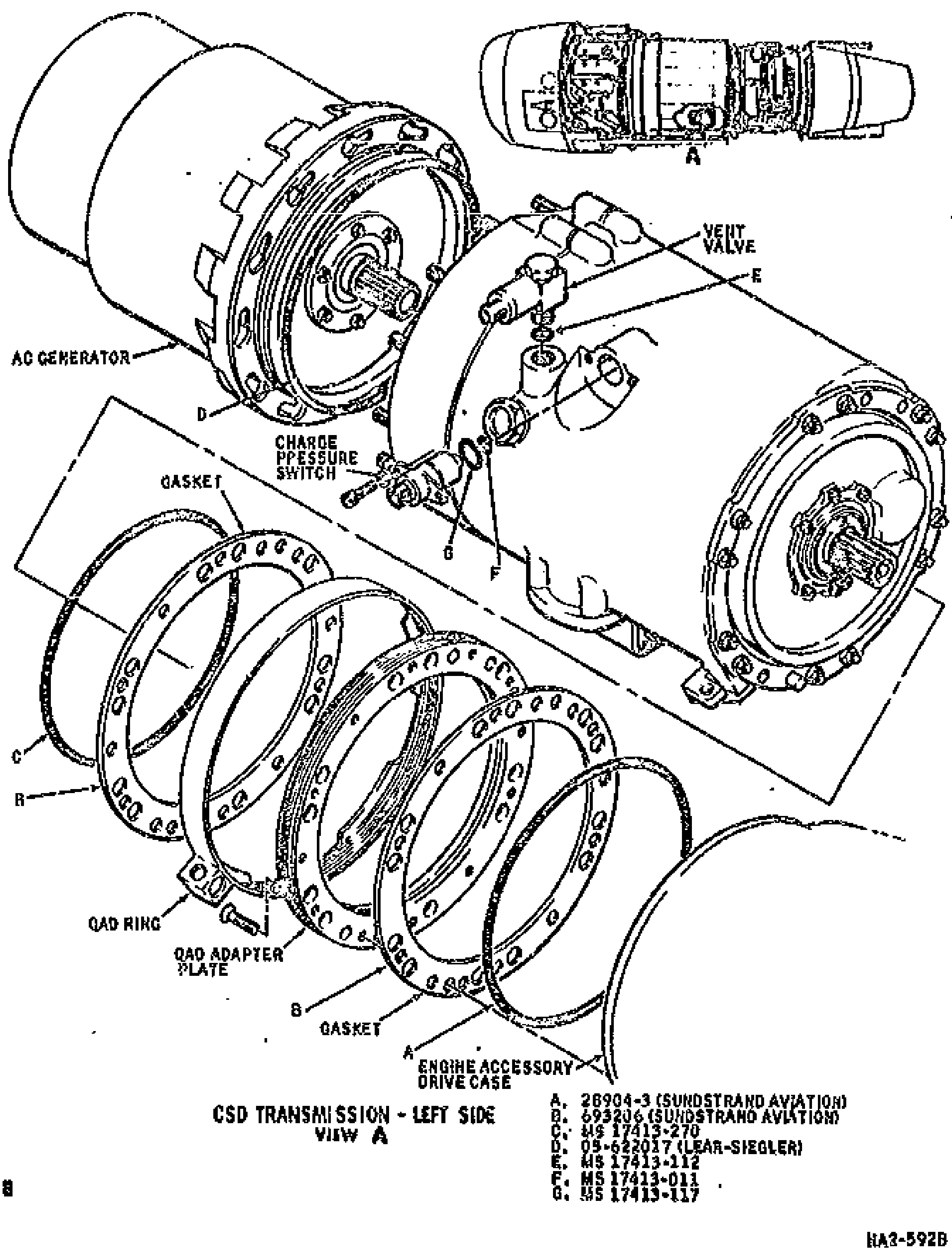
WARNING: DO NOT APPLY EXTERNAL POWER.

(2) Gain access to relay.

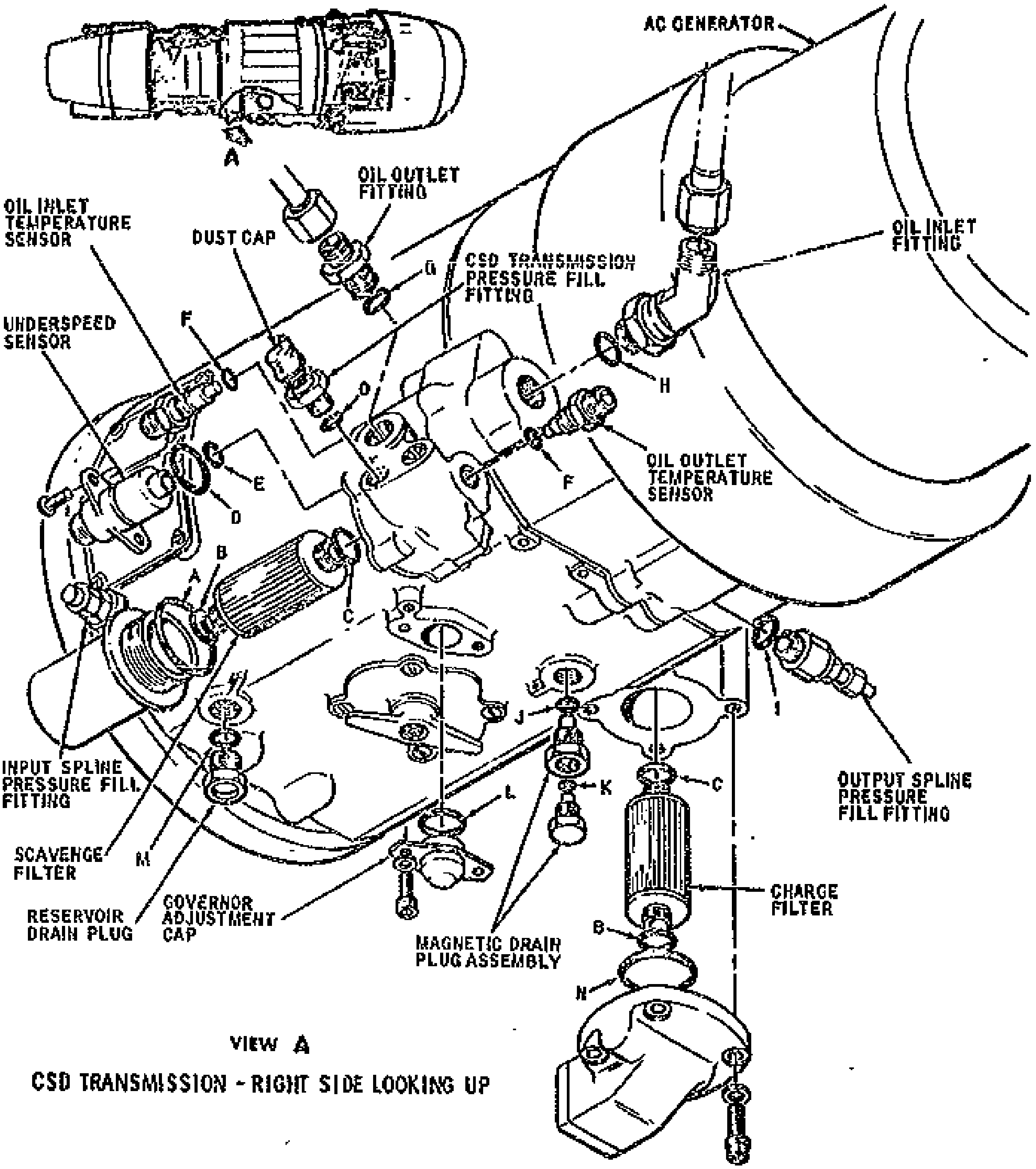
(3) Tag and disconnect wires.

(4) Support relay and remove mounting screws.

(5) Remove relay.



Electrical Power System Components -- O-Ring Installations
Figure 403 (Sheet 1)



VIEW A

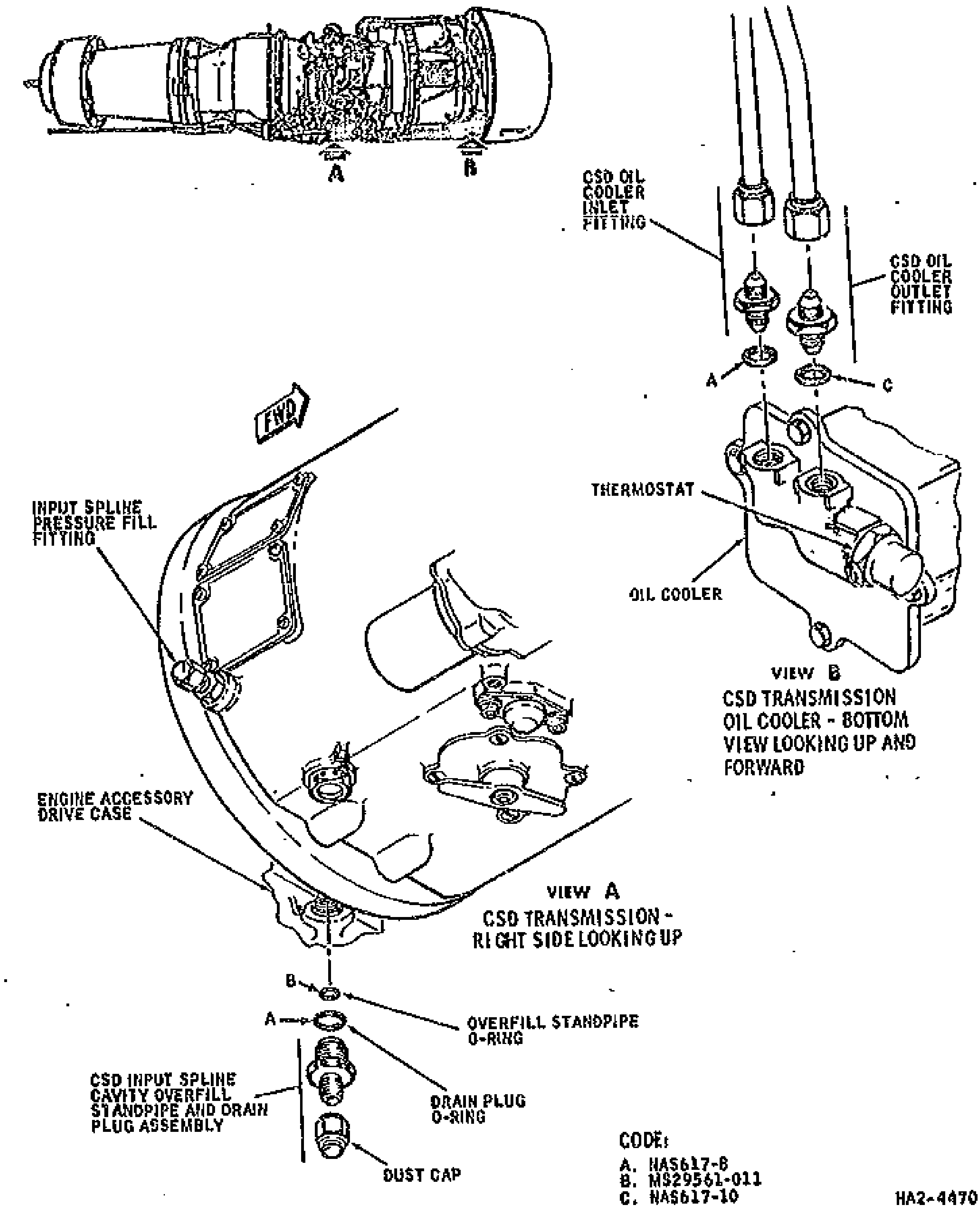
CSD TRANSMISSION - RIGHT SIDE LOOKING UP

A. MS17413-133
B. MS17413-018
C. MS17413-014
D. MS17413-117
E. MS17413-011
F. MS17413-110
G. NAS 617-8
H. NAS 617-10

I. 3634-193-11-70 (SUNDSTRAND AVIATION)
J. MS 17413-111
K. 3634-202-11-70 (SUNDSTRAND AVIATION)
L. MS 17413-016
M. MS 17413-112
N. MS17413-128
O. MS29561-112

HA2-2339A

Electrical Power System Components -- O-Ring Installations
Figure 403 (Sheet 2)



Electrical Power System Components -- O-Ring Installations
Figure 403 (Sheet 3)

D. Install Relay

(1) Make certain that power is removed, as called out in paragraph 2, step C (1).

(2) Position relay.

NOTE: Before installation, make certain that paint is removed from relay mounting flange so that a good electrical bond between relay and structure of airplane is provided.

(3) Install and tighten mounting screws.

(4) Connect wires, making certain that leads are connected correctly.

(5) Remove tags from wires.

(6) Replace parts removed to gain access to relay.

(7) Remove warning tag. Apply external power or close circuit breaker(s) as applicable.

(8) Follow applicable system adjustment test procedures to determine that relay is functioning properly.

3. Electrical Power System O-Rings

A. O-Rings, used when installing the electrical power components and various components on the CSD transmission, are shown and listed by part number in Figure 403.

GENERAL - REMOVAL/INSTALLATION

1. General

A. Removal and installation instructions for components of the electrical system requiring special attention are outlined in procedural steps, to enable the job to be performed easily and efficiently.

B. Removal and installation instructions are not given for components that are secured in position with standard bolts or screws, or secured in a mount assembly with knurled nuts, as removal/installation is obvious. Some components have electrical connectors and/or terminals that need to be disconnected before removal, while other components have an electrical connector that is an integral part of the component. This type connector is usually found on components that are installed on a mount assembly and are mated to a receptacle installed on the mount when the component is properly seated in the mount. When electrical equipment is removed, the receptacle and the plug of the connector should be protected from the entrance of material that may cause damage to the pins or shorting when power is applied to the circuit. (See Figures 401 and 402.)

C. When replacing defective equipment use equipment that has an identical part number unless the use of substitute equipment has been authorized. After installation of serviceable equipment, adjustment/tests should be conducted to ensure that the applicable system is operating properly.

D. Paragraph 2 describes typical removal and installation of a rack-mounted component and of a relay. Procedures may vary slightly with each individual component or relay.

2. Removal/Installation

A. Remove Rack-Mounted Components

(1) Remove electrical power from unit by either step (a) or (b).

(a) Open applicable circuit breaker(s).

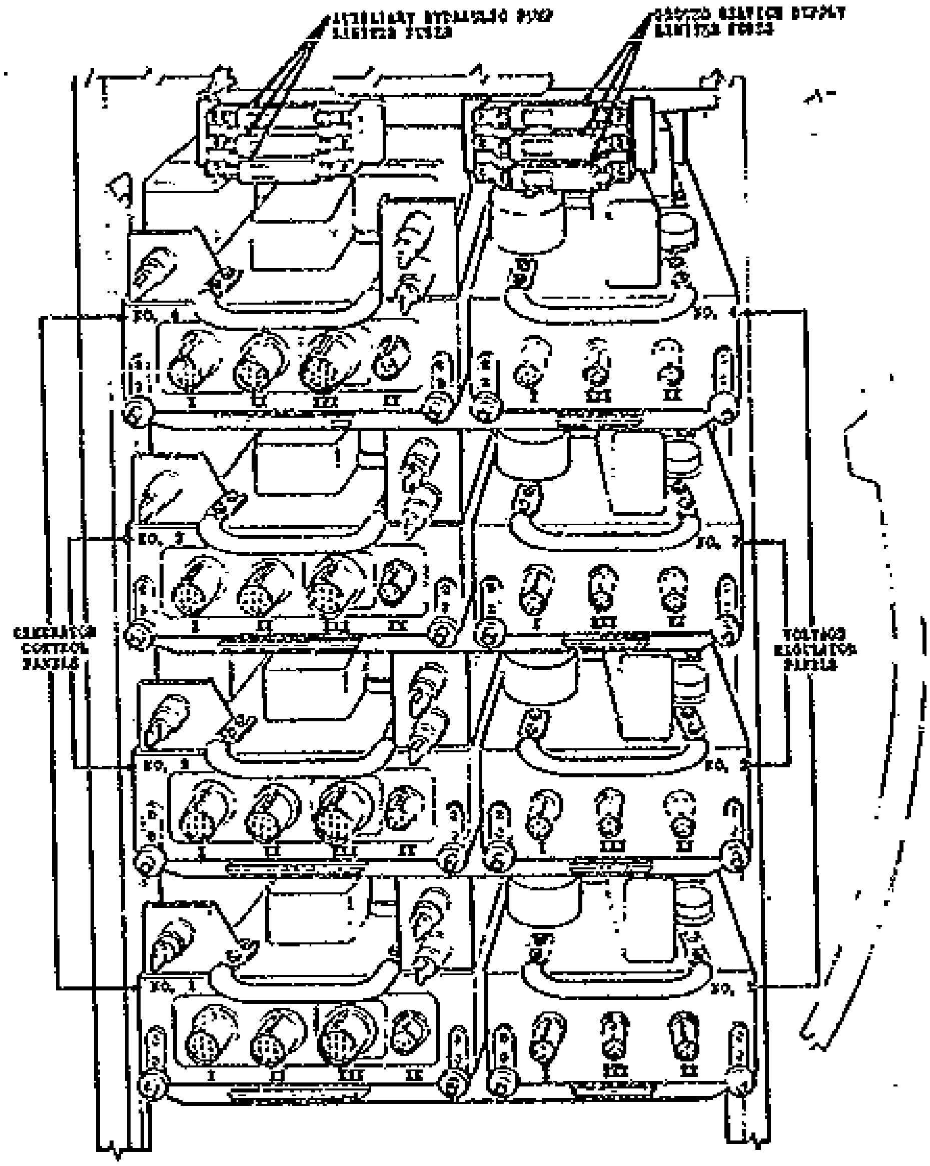
1) Install clamp under open circuit breaker(s). Suitable clamp is HPV-5N (Burndy) or P4-5HS (Nylon Molding Corporation).

2) Tag circuit breaker(s) with warning sign.

WARNING: DO NOT CLOSE THIS CIRCUIT BREAKER. THIS CIRCUIT BREAKER MUST REMAIN OPEN UNTIL COMPLETION OF MAINTENANCE WORK.

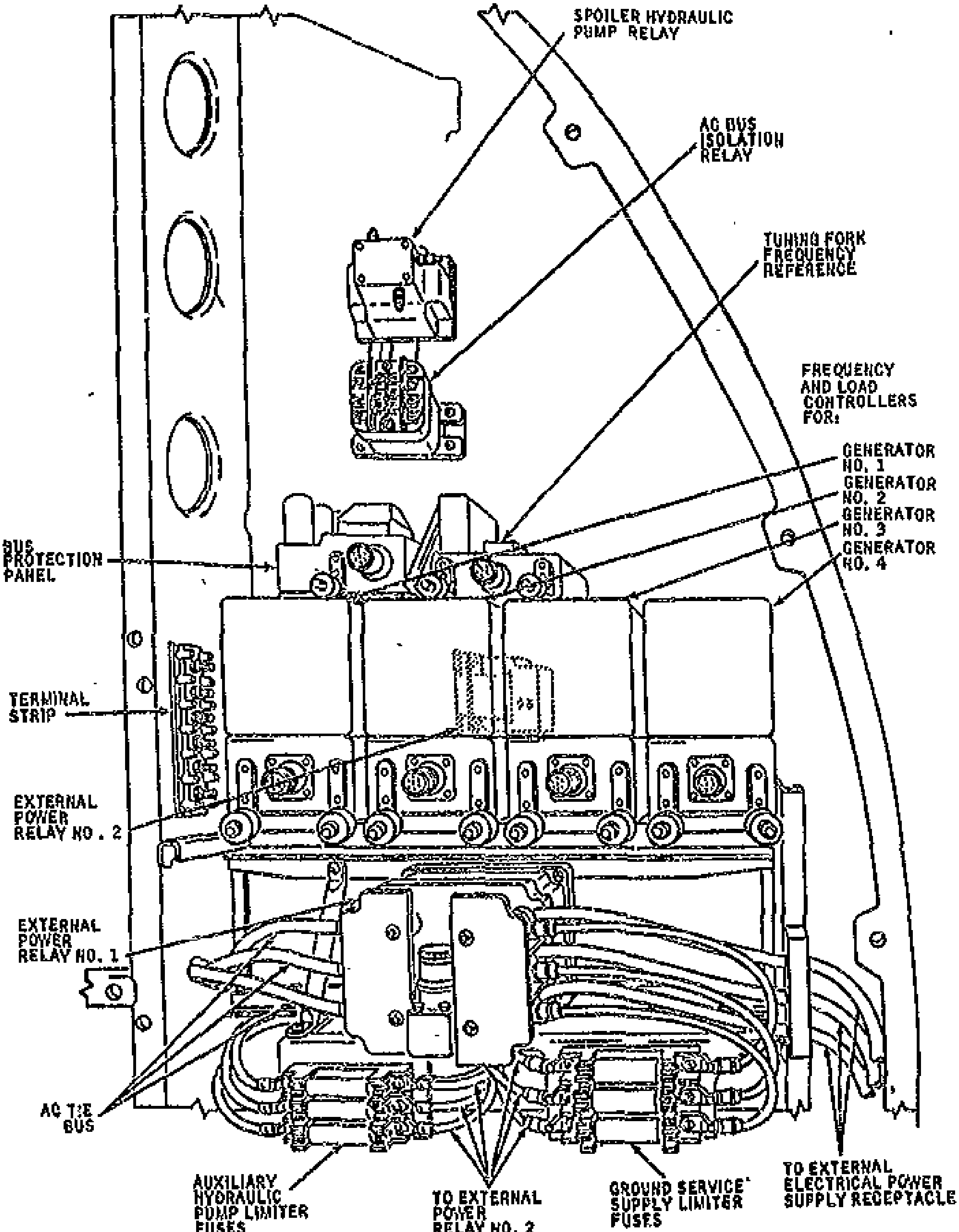
(b) Disconnect external power. Tag external power receptacle with warning sign.

WARNING: DO NOT APPLY EXTERNAL POWER.

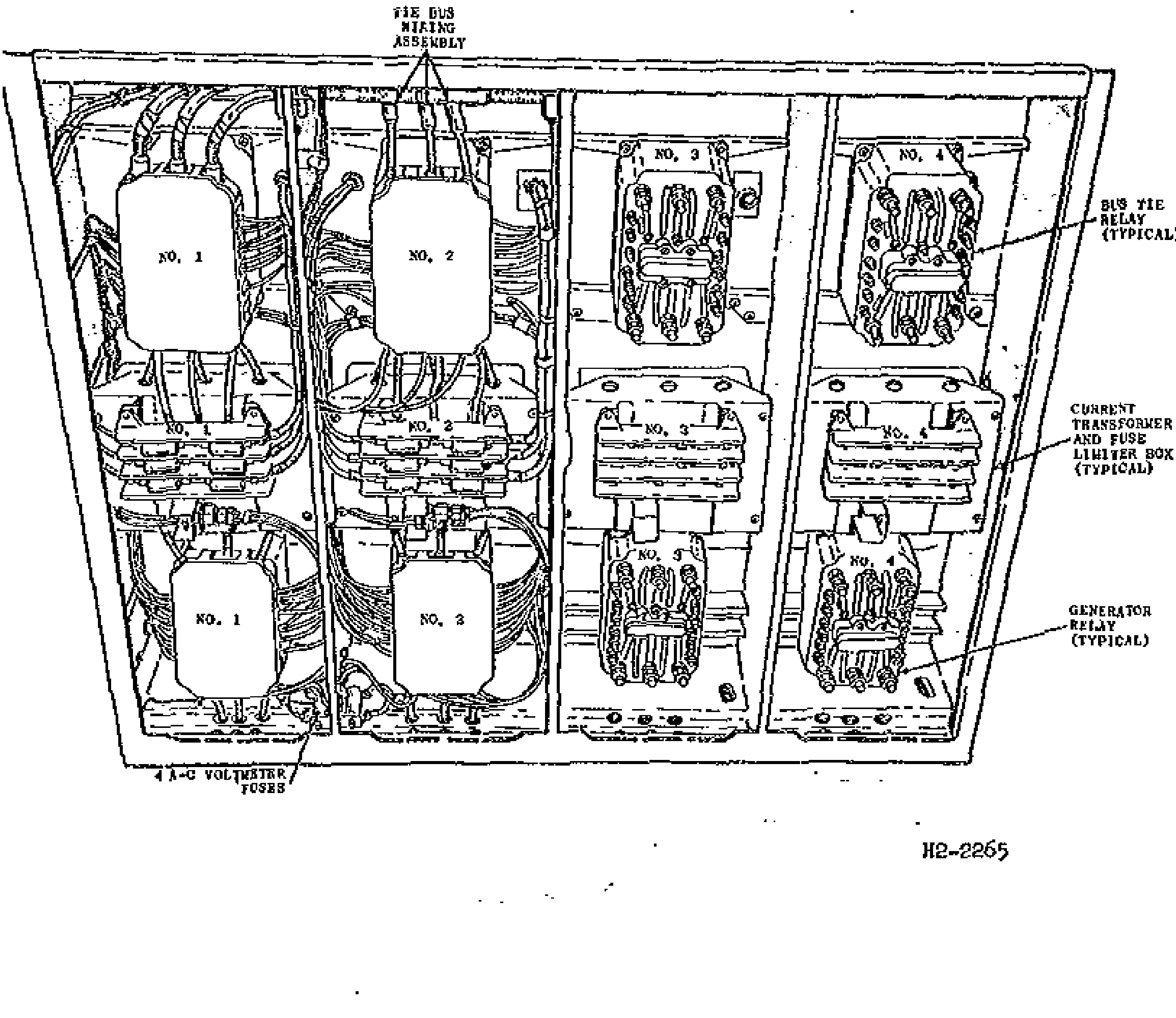


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Generator Control Rack
Figure 401 (Sheet 1)



Generator Control Rack -- Upper Section
Figure 401 (Sheet 2)



Generator Bus Bays
Figure 402

Printed in U.S.A.

(2) Gain access to unit.

(3) Disconnect electrical connectors; cap connectors and receptacles.

NOTE: This step is not applicable to units having an integral electrical connector.

(4) Loosen knurled nuts on holddown assemblies.

(5) Disengage holddown assemblies from mounting brackets.

(6) Pull unit from mount.

CAUTION: TO PREVENT DAMAGE TO ENGAGING PINS AND ELECTRICAL CONNECTOR, DO NOT RAISE UNIT WHEN PULLED FROM MOUNT.

B. Install Rack-Mounted Components

(1) Make certain that power is removed, as called out in paragraph 2, step A (1).

(2) Place unit on mount and slide in as far as it will go. Do not raise unit.

CAUTION: IF UNIT BEING INSTALLED HAS INTEGRAL ELECTRICAL CONNECTOR, MAKE CERTAIN THAT CONNECTOR IS PROPERLY MATED WITH RECEPTACLE TO PREVENT DAMAGE TO PINS OF CONNECTOR.

(3) Engage holddown assemblies with mounting brackets.

(4) Tighten knurled nuts on holddown assemblies.

(5) Uncap and connect electrical connectors to receptacles on unit.

NOTE: This step is not applicable to units having an integral electrical connector.

(6) Replace parts removed to gain access to unit.

(7) Remove warning tag. Apply external power or close circuit breaker(s), as applicable.

(8) Follow applicable system adjustment/test procedures to determine that unit is functioning properly.

C. Remove Relay

(1) Remove electrical power from relay by either step (a) or (b).

(a) Open applicable circuit breaker(s).

1) Install clamp under open circuit breaker(s). Suitable clamp is HPV-5N (Burndy) or P4-5WS (Nylon Molding Corporation).

2) Tag circuit breaker(s) with warning sign.

WARNING: DO NOT CLOSE THIS CIRCUIT BREAKER. THIS CIRCUIT BREAKER MUST REMAIN OPEN UNTIL COMPLETION OF MAINTENANCE WORK.

(b) Disconnect external power. Tag external power receptacle with warning sign.

WARNING: DO NOT APPLY EXTERNAL POWER.

(2) Gain access to relay.

(3) Tag and disconnect wires.

(4) Support relay and remove mounting screws.

(5) Remove relay.

D. Install Relay

(1) Make certain that power is removed, as called out in paragraph 2, step C (1).

(2) Position relay.

NOTE: Before installation, make certain that paint is removed from relay mounting flange so that a good electrical bond between relay and structure of airplane is provided.

(3) Install and tighten mounting screws.

(4) Connect wires, making certain that leads are connected correctly.

(5) Remove tags from wires.

(6) Replace parts removed to gain access to relay.

(7) Remove warning tag. Apply external power or close circuit breaker(s) as applicable.

(8) Follow applicable system adjustment test procedures to determine that relay is functioning properly.

GENERAL - ADJUSTMENT/TEST

1. General

A. Adjustment/test procedures are given as an aid for adjustment and/or test of a complete system or a particular component. Detailed adjustment/test procedures are given in the sections that cover a complete system; that is, dc generation, generator drive, etc. In sections that cover component removal and installation, a simple adjustment/test follows the installation of the component.

B. Before applying power to electrical system to be tested, check that all associated switches located on electrical power and ground service electrical power panels are in off, normal, or open position as applicable.

C. Before starting test procedures, make certain that all circuit breakers associated with electrical power supply and distribution are closed. Throughout this chapter it will be assumed that all breakers associated with electrical power are closed at all times, except as noted.

GENERAL - INSPECTION/CHECK

1. General

   A. This section provides instruction for performing preventive maintenance and damage evaluation checks of the electrical power system and associated areas.

   B. The preventive maintenance check (see Paragraph 2.A) should be performed in addition to scheduled inspection requirements in order to increase the safety and efficiency of the airplane. All readily accessible areas should be checked for discrepancies. In addition, when an area is opened for maintenance practices, a check of the area should be accomplished before the area is closed.

   C. The damage evaluation check (see Paragraph 2.B) is to be performed whenever the electrical power system has been subjected to any of the following improper external power applications:

      (1) Voltage above 123 vac or below 107 vac.

      (2) Frequency above 420 cps or below 380 cps.

      (3) Incorrect phase rotation.

      CAUTION: DAMAGE TO AIRPLANE ELECTRICAL EQUIPMENT CAN OCCUR IF ELECTRICAL POWER SYSTEM HAS BEEN SUBJECTED TO ABNORMALLY HIGH OR ABNORMALLY LOW VOLTAGES OR FREQUENCIES, OR INCORRECT PHASE ROTATION. ALL ELECTRICAL, NAVIGATIONAL, RADIO, AND RADAR EQUIPMENT SUBJECTED TO DAMAGING OVERVOLTAGES SHOULD BE INSPECTED AND FUNCTIONALLY CHECKED ACCORDING TO APPLICABLE MAINTENANCE PRACTICES.

2. Inspection/Check Electrical Power System - Preventive Maintenance and Damage Evaluation

   A. Check Electrical Power System - Preventive Maintenance

      (1) Check electrical wiring for physical damage such as chafing, fraying, and cut or mashed insulation.

      (2) Check wire clamps and supports for security.

      (3) Check that all wiring is supported clear of sharp edges.

      (4) Check wiring for liquid impregnation.

      (5) Check that terminal connections are secure and that lugs are not cracked or do not touch adjacent terminals or structure.

(6) Check that no foreign or metallic objects are lying between terminals.

(7) Check electrical bonding jumpers for security and for frayed or broken condition.

(8) Check electrical equipment for proper installation, security of mounting, physical damage, and evidence of overheating.

(9) Check shock-mounted racks and equipment for physical damage and deterioration of rubber mounts.

(10) Check security of lockwire on electrical equipment and electrical connectors, where applicable.

(11) Check interior of electrical junction boxes for cleanness.

D. Check Electrical Power System - Damage Evaluation

NOTE: The following checks are not intended to cover all areas that can be affected by improper external power applications. The conditions found will determine if further detailed inspection is necessary.

(1) Check external electrical power unit for possible cause of improper external power being applied to the electrical buses.

(2) Check that circuit breakers have not been tripped or damaged and that all fuses are serviceable.

(3) Check external power circuit for evidence of burned or charred wiring insulation; check for damaged power receptacle, bus protection panel, transformer-rectifier, relays, and switches.

(4) Check electrical power center for evidence of burned or charred wiring insulation; check for damaged power relays, bus bars, terminals, and control panels.

(5) Check junction boxes and equipment panels for damage.

(6) Check instrument panels for burned out light bulbs or damaged switches.

(7) Check radio racks for damaged electrical equipment.

(8) Apply external electrical power (see 24-40-0, Description and Operation).

(9) Perform operational check of systems known to be operating or energized during period of improper power application.